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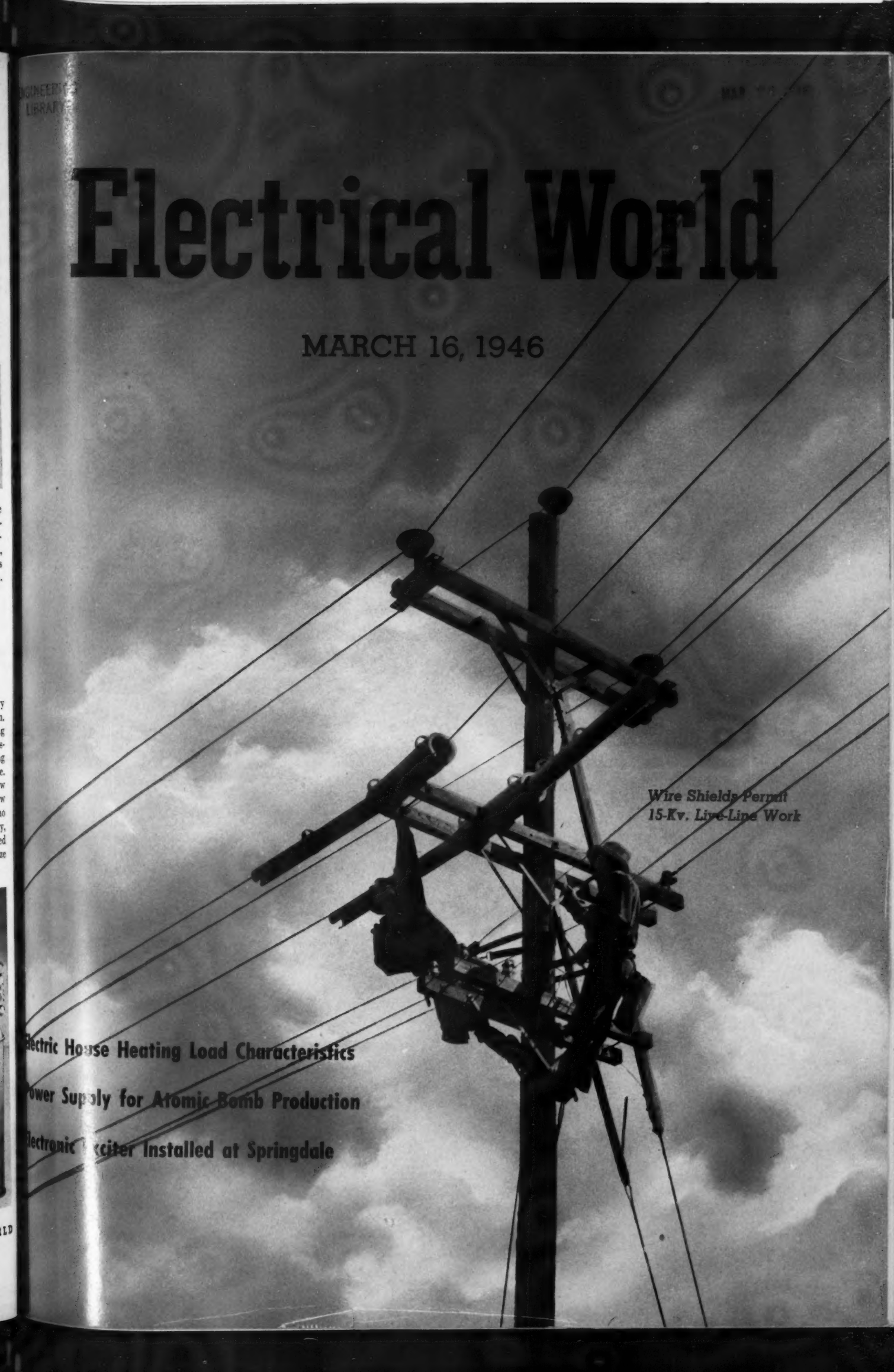
Electrical World

MARCH 16, 1946



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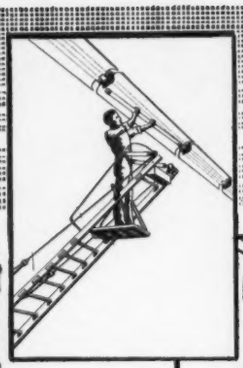

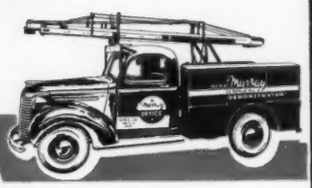

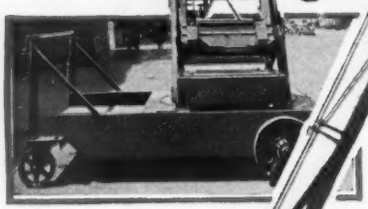

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Electrical World

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March 16, 1946 — Vol. 125, No. 11

Contents

Turbine Evolution Stabilized, Upping of Doubtful Economy 76
J. R. CARLSON, Westinghouse Electric Corp.

E.E.I. Sales Course Clicks in Philadelphia 79

Plastic Live-Line Shields Extend Protection to 15 Kv 80
EARL H. KENDALL, Consumers Power Co.

Tests Will Determine Electric Space Heating Load Characteristics .. 82
W. L. SHARP, Portland (Ore.) General Electric Co.

Some Power Supply Problems at Clinton Engineer Works 85
J. O'R. COLEMAN, Stone & Webster Engineering Corp.

Electronic Exciter for 81,250-Kva. Turbo-alternator 88
H. A. P. LANGSTAFF, West Penn Power Co. and
R. F. LAWRENCE, Westinghouse Electric Corp.

Organized Substation Inspection 92

Editorials ..... 75 and 96

Washington Comment 98

News of the Week 99

HOW 107

Engineering Reference Sheets ..... 114, 116 and 118

Load Building 130

New Equipment 140

News About People 154

Manufacturing and Markets 168

Sales Opportunities 175

Recent Rate Changes 177

Recent Legislation 178

Book Reviews 182

Index of Advertisements 186

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Electrical World

MARCH 16, 1946

Research Policy

ONE of the glamor industries that is attracting men and markets is that devoted to chemical processing. For years it has been expanding rapidly and the promise for the future is even brighter. On being asked the reason for this, the president of one of the medium-sized chemical companies said it could be attributed to the amount of money spent in research. His company, for instance, was spending around 3 percent of its gross in research for new and improved products.

We could not help wondering what the effect might be if a similar policy were adopted throughout the electrical industry, particularly that devoted to power and power equipment, both for supply and utilization. While considerable sums are spent within the industry each year for research, much of the work is concentrated in a few places. There is not the same degree of dependence on research among the smaller producers as among the larger.

During the last few years research has had a great stimulus and new laboratories are springing up but there is room for many more. There can be no question but what the world is in an age of scientific research and any industry that intends to survive the competition of new products and methods must devote considerable time and money to bringing out new ideas of its own.

Nor does the responsibility rest solely with the manufacturers. Service companies must also be alert to the necessity for finding new ways not only to improve the elements of their systems but to use electrical energy economically. Because they are not competitive they can more easily engage in cooperative research and it is in this direction that we expect to see more work done.

Already projects have been started in several states covering farm use. These undoubtedly will expand in number and size, but what of the other markets? Recently the Southeastern Electric Exchange announced a cooperative research on the heat pump. Here is a load that might have great possibilities if more were known about it.

Ahead of the electric utilities is a period of intensive cultivation of markets in order to absorb vast new quantities of power. Presently known and accepted uses will not be sufficient to do the job alone. New methods and equipments that will do the work better than present non-electrical methods must be found.

Federally financed power projects are spending more and more money on research in order to find ways of using electrical energy in large quantities. Can the private utilities do any less?

In addition to seeking new uses, there is need for more load behavior research.

The electric utilities have depended considerably on the manufacturers for product research and even for load behavior information. From this time the utilities must recognize that they have a responsibility in load research that cannot be delegated to other groups. It may not be necessary to spend as much as the 3 percent of the chemical industry but any substantial expenditures, while perhaps lessening the amount of rate reductions now, would serve importantly in prolonging the trend of downward cost to the user.

Turbine Evolution Stabilized, Upping of Doubtful Economy*

Diminishing returns and technology make more than 1,000 deg. F. dubious —War research produced no revolutionary metals for immediate use— Reheat seen as next step—Low pressure blading lengthened—Gas turbine viewed as peaking unit for utility service, cost problematical

J. R. CARLSON, Central Station Steam Engineer, Westinghouse Electric Corp.

CONTINUOUS MECHANICAL and thermodynamics development have produced steam turbines which have reached a high stage of maturity. This continuous research has led to internal blading efficiency and Rankine cycle efficiencies which are very near top levels. Further increases in internal turbine efficiency will undoubtedly prove to be more difficult and more costly to obtain. (Fig. 1) This increase in internal efficiency and adoption of higher initial operating conditions has been obtained by a series of logical advances. As a result a very high degree of reliability is obtained even with the huge 3,600-rpm. turbine generators of today, operating at the highest economical pressures and temperatures.

* Adapted from paper at recent Raleigh meeting of Engineering and Operation Section, Southeastern Electric Exchange.

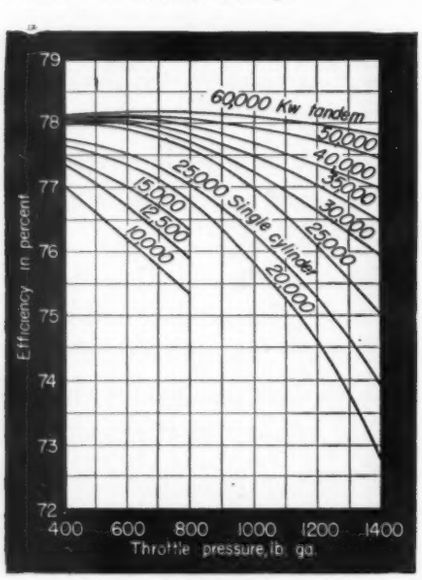


FIG. 1—Basic efficiency curves for air-cooled turbine-generator units at 300 deg. superheat, 1-in. absolute exhaust and 3,600 rpm. Single cylinder, 10,000-25,000 kw.

Diminishing Returns

Further increases in thermal efficiency can be obtained by raising temperatures still higher. Steam temperatures of 1,000 deg. are possible, and even higher values will be contemplated in the future. However, instead of obtaining a reduction in heat consumption of approximately 3 percent for each 100 deg., the law of diminishing returns is rapidly becoming effective; therefore, it is doubtful that turbines designed for temperatures much in excess of 1,000 deg. will prove to be economical. Fig. 2 shows the approximate thermal efficiency that can be obtained when using regenerative feed water heating, and when combining the most advantageous pressure with each temperature.

Improvement Limited

It can be seen that the optimum efficiency at 1,000 deg. inlet temperature is approximately 32 to 33 percent. Even if materials were available to permit higher temperatures than the 1,000 deg., the optimum plant efficiency would be approximately 34 percent or 10,000 B.t.u./kw.-hr. Without reheat and unless some new and unforeseen methods are forthcoming, the minimum practical heat rate of a steam plant almost regardless of cost is in the order of 10,000 B.t.u./kw.-hr. Consequently, the present margin for improvement in heat rate is narrow.

What may be obtained from the re-

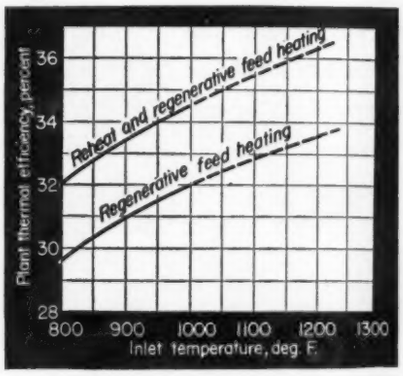


FIG. 2—Effect of reheat on best plant thermal efficiency

heat cycle is shown in Fig. 2. The reheat cycle has been used rather widely in Europe. In this country with the advent of the better alloys, allowing the initial temperature to be sharply increased, its use has been of a minor nature. The principal objection to the use of reheat has largely been one of operating difficulties. However, as our metallurgists are not too hopeful that the continued search for better materials will prove fruitful and as the law of diminishing returns places a top limit on initial temperature, we are forced to give consideration to the reheat cycle. With the addition of a single stage boiler reheat, something like a 5 percent reduction in heat rate may be obtained, using equal upper temperatures. Or addition of a single stage boiler reheat is roughly equivalent in efficiency of the regenerative feed water heating cycle to an increase in initial temperature of approximately 200 deg. F. When and if the pressure of increasing fuel costs dic-

tates that more efficient steam plant be constructed, the use of boiler will undoubtedly receive renewed attention. Of course, it is to be expected that the use of boiler reheat will be confined to the larger turbines of the multi-cylinder type.

High Temperature Alloys

Physical properties and creep characteristics of existing turbine alloys at elevated temperatures have been established by extensive research. Working stresses must be sharply reduced at high temperature, if excessive plastic deformation or creep in service are to be avoided. Creep, time, stress and temperature form a closely associated relation in the use of metals for high temperature work. With our existent metals, an increase in operating temperature can only be obtained by a reduction in stresses or by an increase in allowable total creep or plastic deformation.

Through the Office of Scientific Research, our metallurgists have actively been working with other companies and under government direction in the development of new materials for high temperature service. But all of the war-time research has not given us any new material which we can use as fundamental parts of steam turbines. Eventually some of the newer high temperature resistant metals may be used for such parts as blading, valve lift rods, valve trim and other small highly stressed parts in a steam plant. But at present, the high cost and difficulty of obtaining anything but small castings simply precludes their use in large turbine work.

Only Same Materials

To date only small castings or forgings have been obtainable of metals containing high percentages of chromium, nickel, cobalt, to which has been added "vitamins" such as tungsten, titanium, molybdenum, columbium, and vanadium. It is only reasonable to state that the development of such high temperature gas turbines as the jet engines have been possible only by using these very costly materials, and a decrease in the life expectancy. We have then emerged from World War II with essentially the same materials for steam turbine application that were in common usage in the prior years. The one outstanding improvement has been the addition of approximately 0.5 percent chromium with the cast carbon molybdenum steels.

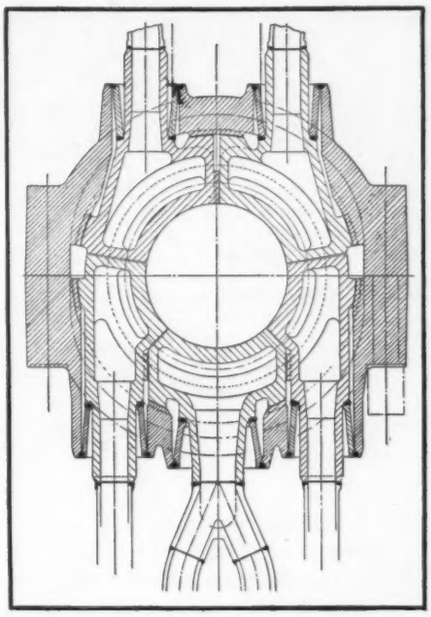


FIG. 3—Steam chest arrangement for high-pressure, high-temperature turbine

Some difficulty has been experienced with the graphitization of the cast carbon molybdenum steels for temperatures of around 950 deg. The A.S.T.M. and A.S.M.E. through a joint committee have conducted tests at elevated temperatures which indicate that the addition of approximately 0.5 percent chromium acts as an inhibitor and prevents the carbide from dissociating into carbon and iron. It is this inhibited carbon molybdenum steel that we propose to use on the large turbines of the day built for temperatures of 1,000 deg. F. It is not to be expected that we will use the material without incorporating features in the turbine to minimize the effect of high temperature. Fig. 3 shows an ingenious method of confining the parts subjected to the high pressure and high temperature to relative small size. These castings are constructed so as to eliminate bolted joints, and when combined with small areas exposed to high pressure steam, effect a material reduction in unit stress. The internal nozzle chambers are supported in such a manner as to minimize the effect of differential expansion.

Forged Lashing

Some ten years ago the 20-in. long exhaust end blading was developed which permitted single-case turbines to be built in size 25,000-kw. normal capacity. By double-ending these low pressure ends, single shaft turbines of 60,000- and 65,000-kw. capacity were possible. Fig. 4 shows a typical group of such low pressure blading. A lashing wire is used to tie the blades into groups. This lashing wire is welded to the blades and the weld ground to form as smooth a radius as possible. However, due to the welding operation and the difficulty of forming smooth radii, difficulty has been encountered at this point.

In an attempt to avoid the use of welding at the body of the blade where high strength is needed, a method was developed of forging the lashing wire integral with the blade. By forging the lashing wire integral, a smooth radius is formed at the junction of the lashing wire and the blade proper. The point where the lashing wire is welded together is confined to a very lightly stressed region rather than in the body proper. The result is the marked reduction in the stress concentration.

Low-pressure Blading

Continued improvements in the mechanical details of low pressure blades together with adequate moisture erosion protection has led the industry to extend even further the scope of the 3,600-rpm. turbine. By developing a low-pressure-end blade of approximately 23 in. in length, the requisite exhaust-end annulus can be obtained to build a tandem compound double flow machine of 80,000-kw. nominal capacity. This exhaust-end blading will be patterned very closely to the existent 20-in. blade. An 80,000-kw. tandem compound double flow machine has been developed. This is an 80,000-kw. turbine designed for inlet steam conditions of 1250 psig. and 1,000 deg. F.

Along with the use of separate nozzle chambers and the longer exhaust end blading is incorporated an internal bypass; the purpose of the bypass is to permit the impulse chamber pressure to be raised to a high value so as to obtain good internal efficiency. To prevent the impulse chamber pressure from rising to high values under the overload condition, the bypass valve opens, thus bypassing a portion of the steam around the first blade group. The impulse chamber pressure can thus be limited in value, which ma-

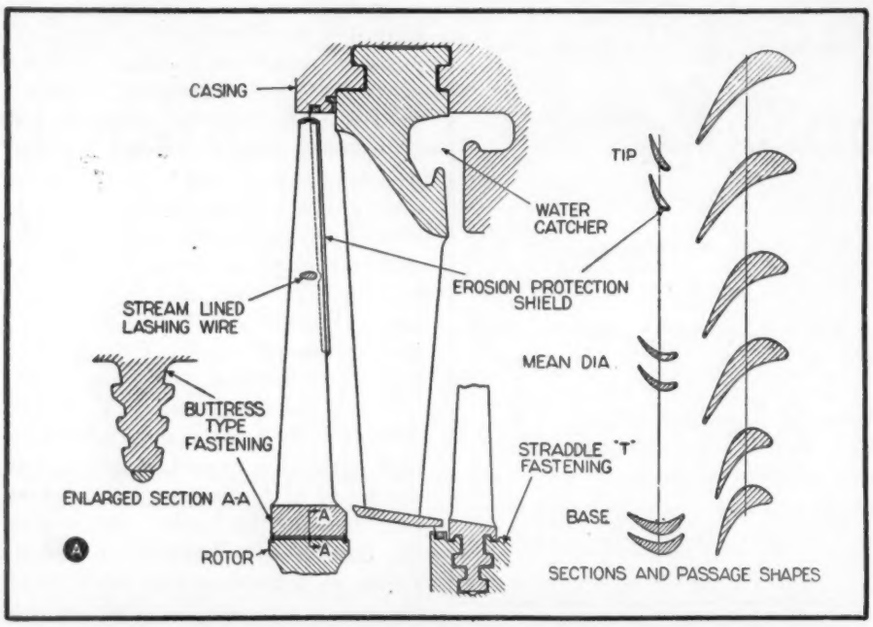


FIG. 4—Low pressure reaction blading. Lashing wire ties blades in groups

terially helps solve the problem of bolting in such a large machine operating at 1,000 deg.

Navy Followed Utilities

No discussion of central station turbines would be complete unless some reference was made to the large turbines used in our heavy aircraft carriers and battleships. In no case has the vast amount of research and engineering contributed anything to our fundamental knowledge and technique of building central station turbines. In fact, the development of the central station turbine was such that our Navy could freely borrow from our practice and be assured of efficient and reliable machines.

Probably the most important considerations which we may borrow from the huge number of turbines built for the Navy are:

1. The experience gained in building steam turbines by welding prefabricated parts and subassemblies to form the complete unit.
2. The use of the blunt edge reaction blade with riveted shrouds. The riveted blades eliminate the necessity of welding, and it is this practice which has been borrowed from the Navy turbines and incorporated in the design of the central station machines.
3. An accumulated experience in building the impulse type turbines for the high pressure elements of Navy equipment. With mounting pressure and with the resultant smaller steam volumes, the impulse high pressure turbine and the reaction low pressure turbine have worked out admirably well for Navy equipment.

Gas Turbine

Little has been said herein about the gas turbine, the reason being that the central station turbine, by virtue of its very high economic status, has the least to fear from other means of power generation. Certainly the economics of a 1,000-deg. operation plus one stage of boiler reheat will be thoroughly tried out before gas turbine generation even remotely tends to compare. However, development of the gas turbine is being prosecuted simultaneously with continued development in the steam turbine field. We believe there will be installations of gas turbines in the central station field. However, they will be of a nature that will supplement steam generation rather than supplant it.

For example, there will undoubtedly be installations on gas turbines, let us say of 5,000-kw. capacity, which will serve to carry peak loads, that is "peaking plants." Such a gas turbine will be of low efficiency and because of few hours' operation, will give long life. However, the production costs of such gas turbines are very much an unknown quantity. In the meantime, we will continue to use the steam turbine in its present state as a primary source of power and as the pressure of slowly increasing fuel costs become greater and greater, the turbines and steam generators for maximum economic efficiency will be ready.

•

Electrostatically Sprayed Porcelain Enamels

Researches indicate that the same factors which make electrostatic spraying feasible for paints and varnishes warrant the application to porcelain enameling. These researches were conducted by James B. Willis of Pemco Corp. laboratories and reported in the May, 1945, Journal of The American Ceramic Society. For the paint spraying operation see ELECTRICAL WORLD, December 8, 1945, page 115.

Single phase, half-wave, 60-cycle voltage (current not exceeding 10 milliamperes) of 100,000 is applied so that the object to be sprayed is grounded and surrounded by an electrical field which imparts a negative charge to the atomized particles sprayed into the field. Fine copper wires 6 to 8 in. apart are suspended parallel to the surface to be spray-coated; this electrode system should conform to the contour of the sprayed object for best results. The electrode wires are kept 10 to 12 in. away from the object. A No. 30 copper wire is recommended.

Best results were obtained at a specific gravity of 1.70, a fluid pressure of 20 psi. Dielectric strength of a material was found to have no effect on the ability of the material to react to the electrostatic force. It is found that the axis of the spray must make an acute angle of about 15 degrees with the surface to be coated.

E.E.I. Sales Course Clicks in Philadelphia

Enrollment piles up, requiring formation of additional classes, as dealers crowd in to learn techniques of electric appliance selling

TEN CLASSES started first and four more added inside a month, in a total registration of 394—that's how the "Basic Sales Training Course," prepared by the Edison Electric Institute in consultation with the National Electric Wholesalers Association, is taking hold in Philadelphia.

The course is sponsored by 28 wholesaler and distributor members of the Electrical Association of Philadelphia. It was offered to electrical dealers and members of their sales staffs.

Response of the dealer group was immediate and numerous. Initial registration counted up to 273 students who were divided into ten classes. Enrollments continued as the classes got going and in three weeks a waiting list of 103 had accumulated. By the time this account is printed, four more classes with an enrollment of 121 will have been started, bringing the total registration to the figure of 394 above stated.

Analysis of the initial registration of 273 shows 123 companies represented. They include all kinds of sellers of electrical appliances, hardware and department stores as well as merchandisers of exclusively electrical lines. Owners and other heads of dealer firms number 53 in the enrollment, about 20 percent of the total. Another 10 percent or so are wholesaler and distributor personnel. The remaining 70 percent are dealer employees or, in a few instances, people whom dealers intend to employ when they get things to sell. One such man is driving a bread delivery truck while he takes the course to prepare himself for an appliance salesman's job. The ladies are represented, too; of the 273 in the initial enrollment, 14 are women.

Ten instructors, recruited from wholesaler, distributor and electric utility personnel, all trained and experienced sales executives accustomed to teaching how to sell, took over the initial ten classes. When the additional classes were proposed, eight of the instructors said they were willing to carry two classes and four of them were selected by lot. Instructors are paid and each class has a paid operator for the projection equipment.

Classes are held in rooms in one of the buildings of the Philadelphia Electric Co., the utility providing that accommodation. The first class of the course was given to all enrollees at once in the auditorium of the Edison Building. Attendance at this meeting, here pictured, totalled 328, including other interested persons in addition to those registered for the training course. The course was launched at this meeting with a talk on the importance of selling, the opportunities for salesmen, and the future of the industry, by George E. Whitwell, vice-president, Philadelphia Electric Co.

Cost of conducting the course averages out to $20 per enrollee. This includes the cost of $7.50 per set for twelve salesmanship manuals which are given to each student. The charge per person is $5, paid by him or by his employer.

Class sessions are from 7:30 to 9, an hour and a half. It was originally planned that sessions follow the suggested routine of three definite periods, one for complete showing of the sound-slide film, next the trailer of frames lifted out of the film for the expounding and emphasizing of specific points by the instructor, and last a discussion time for members of the class to bring up their questions. It was soon found that this routine was impractical. Questions came more easily into the minds of the class members and were more freely advanced as the specific points of the trailer were laid before them. Thus when the instructor was finally able to terminate the trailer period it was usually found that little or no time and few or no questions were left for the scheduled discussion period. This condition was recognized by combining the trailer time and the discussion time allotments into one period.

It often happens that the enthusiasm of the individual, high at the start of a program of study and training, peters out as the course continues. The students who pay for courses and don't finish them are the ones who make correspondence schools profitable. Appreciating this human frailty, and offering an incentive to overcome it, the Electrical Association will be host at a dinner at which "graduation" certificates will be presented to all enrollees who have attended ten of the twelve class sessions.

TEN CLASSES, totalling 273 enrollees, take first lesson of sales training course together

Plastic Live-Line Shields Extend Protection To 15 Kv.

Tubular enclosing shields of high dielectric strength phenolic plastic permit live-line work adjacent to conductors of voltages in the "no-man's land" above those on which rubber protectors can be safely used—Upper voltage limit for safety using shields is 14,400 volts

EARL H. KENDALL, General Engineering Dept., Consumers Power Co., Jackson, Mich.

A HOT LINE SHIELD for covering energized conductors of voltages up to and including 14,400 has been developed by this company and is now available for general use.

This shield was designed primarily for use on circuits at voltages above those on which rubber protectors can be safely used. Many such circuits are built below transmission circuits of higher voltage. Before hot line work could be done on the transmission line, in the past, it has been necessary to spread the conductors of the underbuilt circuit with hot line tools to secure safe working clearances. The shield, by covering the conductors with an insulating barrier, eliminates the need for spreading them. Beyond this application, however, it is expected that the shield will be useful for work on all distribution circuits where it can be physically installed.

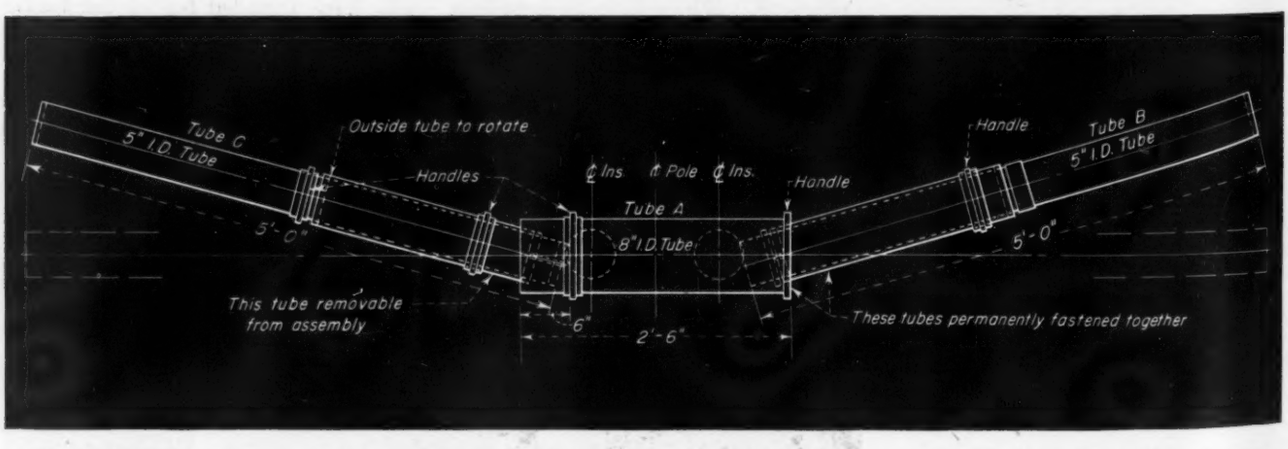
Essentially the shield consists of three tubes of insulating material slotted on the bottom for installation over conductors and insulators of tangent or small angle structures, as shown. The center tube, which fits over insulators on the cross arm, is 8 in. in diameter; two end tubes, which cover the conductors on either side of the insulator, are 5 in. in diameter. These sizes are large enough to cover the largest insulators on either single-arm or double-arm structures of circuits up to and including 1/0 ACSR with armor rods. For convenience in installation one section of 5-in. tube and the 8-in. tube are permanently fastened together and are mounted on the conductor as a nested unit. When in place on the conductor the 8-in. tube can be telescoped over the insulators. The remaining 5-in. tube is then inserted in the opposite end of the 8-in. tube.

All tubes are prevented from rotating by interlocks and are held in position by the insulator pin. In addition each 5-in. tube has a rotating section, near the crossarm, for covering the slot to prevent the assembly from being lifted off the conductor and to prevent accidental contact with the conductor.

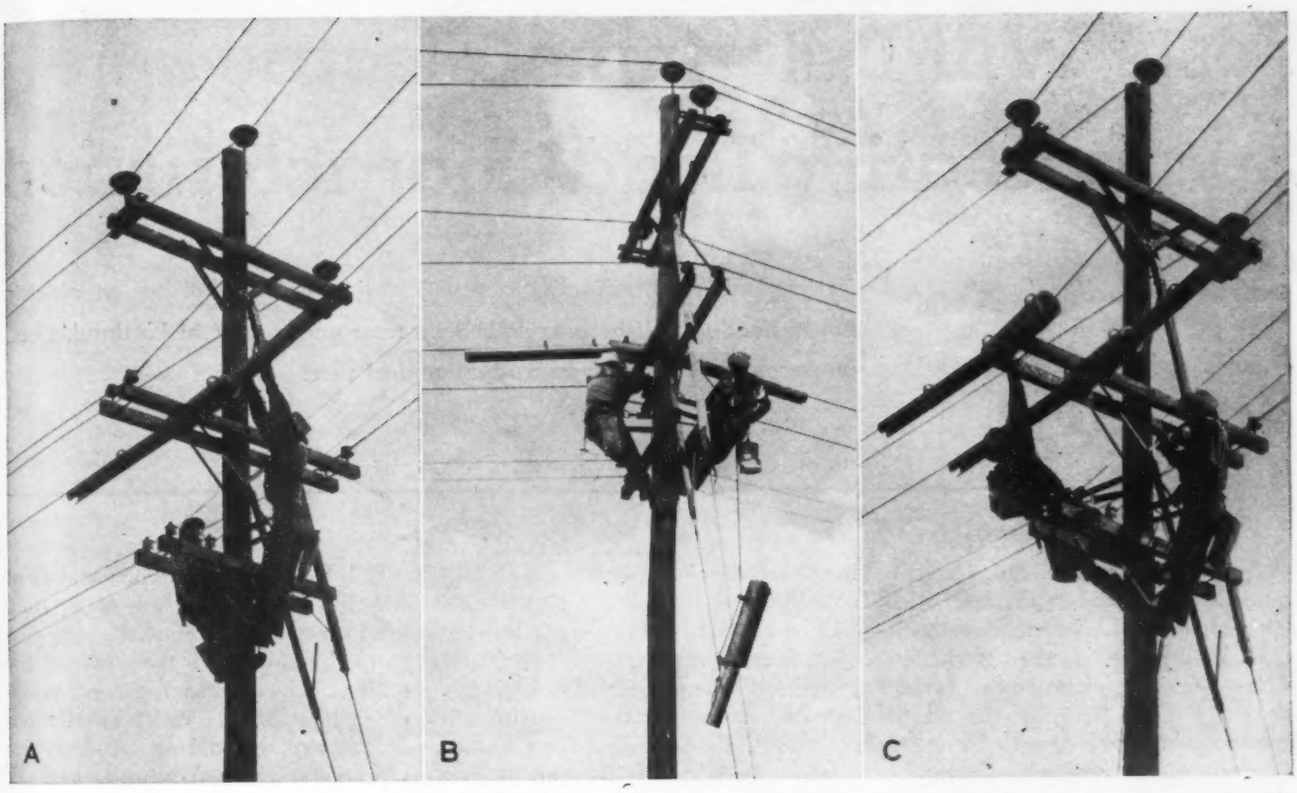
The entire assembly is sufficiently flexible to take the normal sags and angle of the conductors ordinarily installed on pin insulation.

Laminated Plastic

The shield is made of laminated phenolic plastic material and is entirely without metal parts. Inner portions are of paper base plastic of high dielectric strength while the outside is a canvas base plastic with good mechanical and flexure strength. Tubes that make up the shields are formed from phenolic plates to take advantage of the higher dielectric strength of plates compared with tubes of the same material. The shield will withstand a 42,000-volt, 60-cycle step-by-step punc-



SHIELD DESIGN, shown, permits line conductors and insulators up to 14,400 v. to be completely covered, providing clearance for live line work. Center and right hand shield sections, A and B, are permanently fastened together and can be telescoped. Section C is removable but can be locked in once it is inserted. Tubes are slotted on bottom for installation over conductors and insulators. Partial sleeves on portion of end tubes can be rotated to enclose conductor adjacent to crossarm



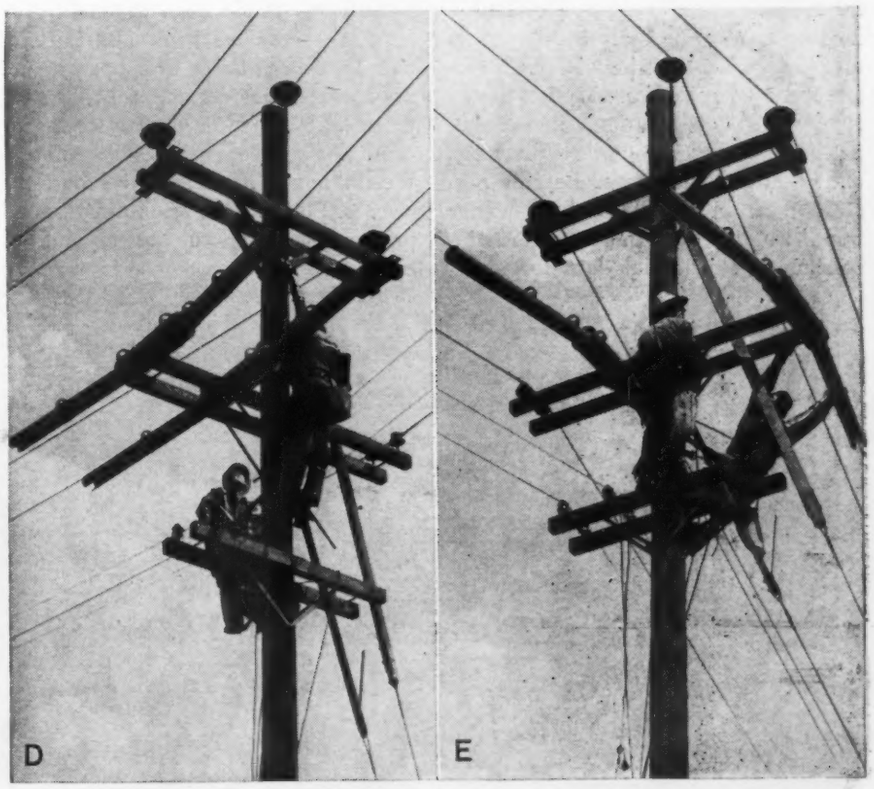
ture test at any point and a 35,000-volt, 60-cycle creepage test, which provides an ample factor of safety for shields kept in good condition.

While the shield has good mechanical and electrical strength, care must be exercised to prevent any damage to it that will reduce its protecting value. Containers have been designed for either a single unit or a three-unit set, which are adequate for carrying on the line trucks. While these shields must be given routine inspections and occasional dielectric tests, it is felt that the requirements in this respect will not approach that required for rubber protectors.

Practicability Established

For over a year this shield has been used on the system on an experimental basis to perfect the design and to prove it as a practical protector.

Accompanying photographs show shields being installed by Art Thomas and Lee Bender of the production and transmission department to cover a 5,000-volt circuit through which they must climb to work on the 44,000-volt circuit. Notice that although the shield is equipped with insulating handles, rubber gloves are used and that it is not necessary to climb above the circuit to make the installation.



LIVE-LINE SHIELDS are being installed, above, to cover a 5,000-v. underbuilt circuit through which men must climb to work on the 44,000-v. circuit. In (a) one shield is already in place. (b) The two telescoped sections of second shield are being raised. They will be dropped over the conductor to one side of the double arm and the large center tube slipped over the insulators as in (c). Next the third section is dropped over the conductor and locked into the center section (d), after which partial sleeves are rotated on each end tube to close slots and completely enclose the conductor. An example of shielding on opposite sides of pole is shown in (e). Assembly takes normal sags and angles

Tests Will Determine Electric Space Heating Load Characteristics

Demand, diversity, distribution costs and other information on electric house heating will be established by tests under way in Portland, Ore., on space heaters in rooms and on central units

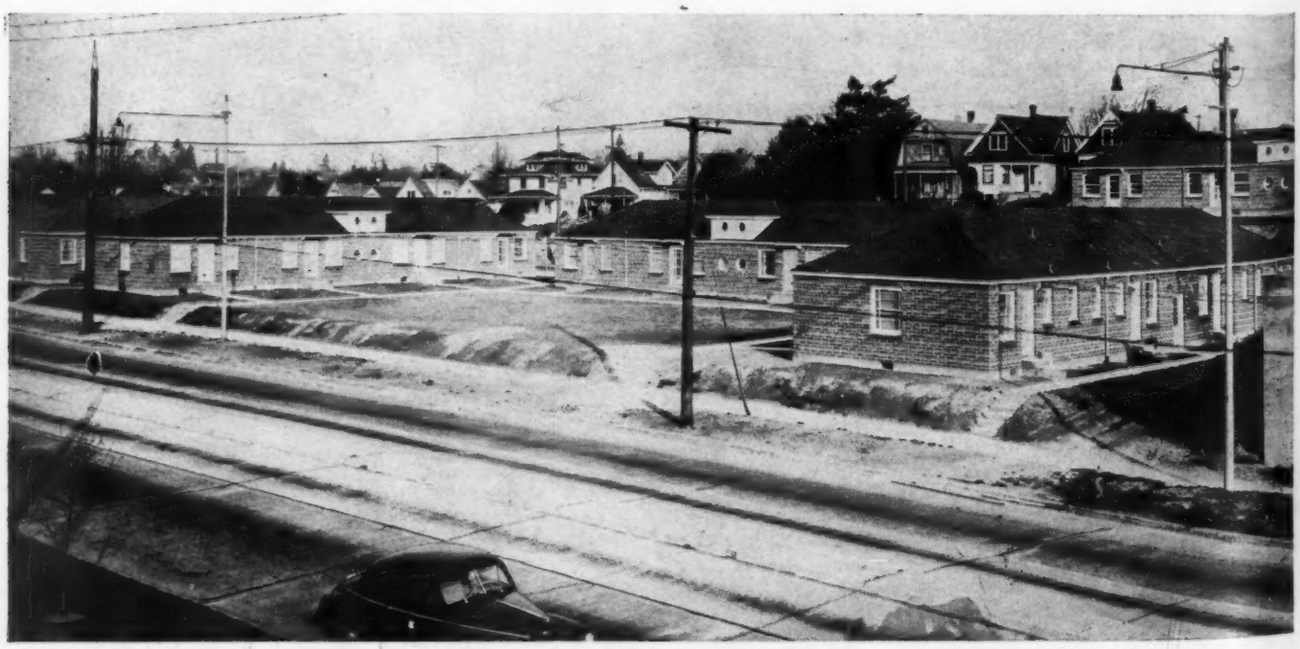
W. L. SHARP, Rate Engineer, Portland (Ore.) General Electric Co.

AN INVESTIGATION of electric house-heating load characteristics which commenced last October and will continue throughout the 1945-1946 heating season is expected to provide answers to various problems which Portland General Electric Co., sponsor of the tests, and other Pacific Northwest utilities must have before they can enter into intensive promotion of house-heating load with their eyes open to all possible effects it may have on rate structures, required distribution capacities, new distribution investment, daily and seasonal peaks, diversity, and other related factors. Barring possibility of an unusually mild winter which would tend to make the tests inconclusive, substantial data for arriving at certain conclusions will be available by June, 1946, and complete data will be ready to use at the start of the 1946 heating season.

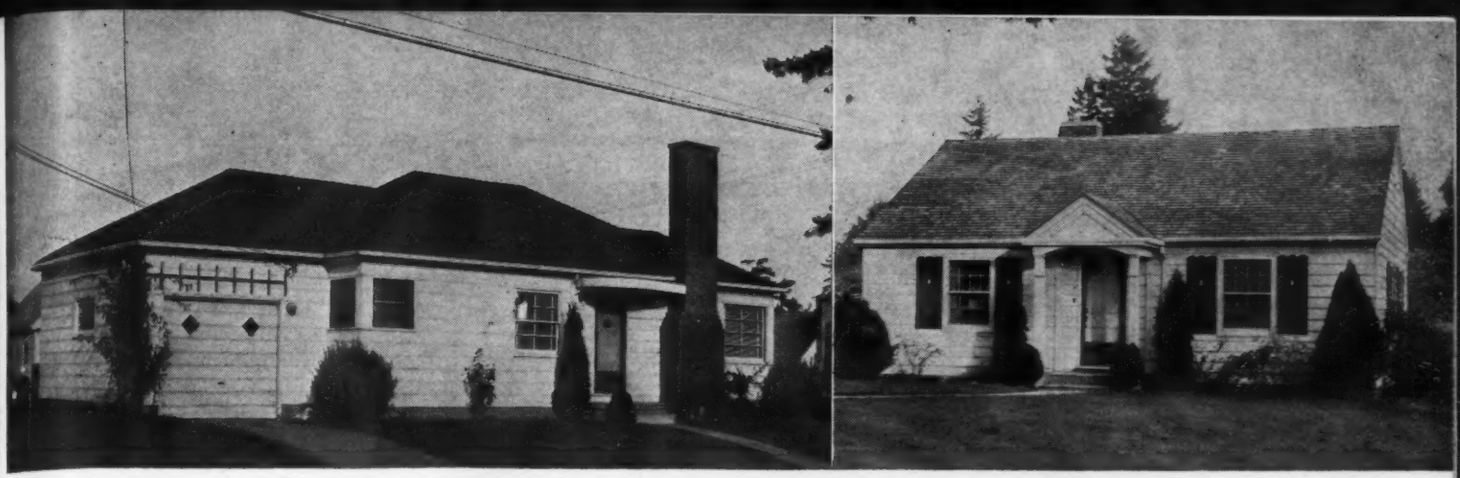
While Portland General Electric Co. initiated the tests purely from its own standpoint to determine the effect of electric house-heating load on its own system, interest of other utilities and manufacturers has been wide, with the result that various firms and individuals have been eager to cooperate and are lending considerable aid to the experiment. Assisting in the work, for example, are engineers representing Westinghouse Electric Corp. and the General Electric Co., who are interested principally from the standpoint of equipment design.

Only two of the several methods of electric house heating are being studied, inasmuch as they are the ones generally employed in the area of the utility. The company began encouraging a limited number of installations on an experimental basis some five years ago. The two methods are (1) the centrally located and controlled, forced warm air circulation type of system, and (2) unit resistance heaters located in various rooms of the dwelling, both types being thermostatically controlled.

On the service of each of the test residences, a recording demand watthour meter has been installed to measure the total load, including that of space heating as well as that of other household



ONE HUNDRED 2- and 3-room apartments of this general type are now being electrically heated in Portland



TYPICAL of the electrically heated homes under test to determine load characteristics

appliances, plus a second similar meter to measure the space-heating load separately. Charts and kilowatt-hour data obtained from the meters will be combined in various ways and analyzed with the general objective of determining diversity and developing therefrom a suitable rate for application to house-heating service.

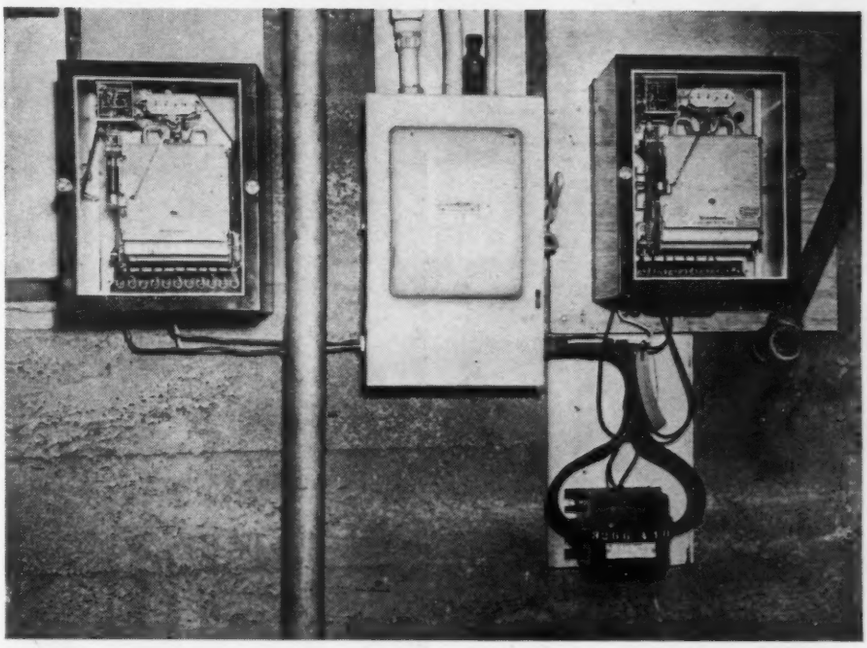
Specifically, objectives of the tests, which will cost in excess of $50,000, are listed here.

Determination of:

(1) Load characteristics by hours, days and months for individual residences, covering both total load and space-heating load separately.

(2) Load characteristics for the combined load of all residences under test, covering both total load and space-heating load as separate items.

(3) Total load and space-heating load characteristics for the combined central warm air installations.



TWO RECORDING demand watthour meters are installed at each test dwelling, one on the total load and the other on the electric space heating only

INDIVIDUAL thermostatically controlled space heaters are one of the two methods of electric house heating under test for load and cost information

(4) Similar load data covering the combined unit resistance heater installations.

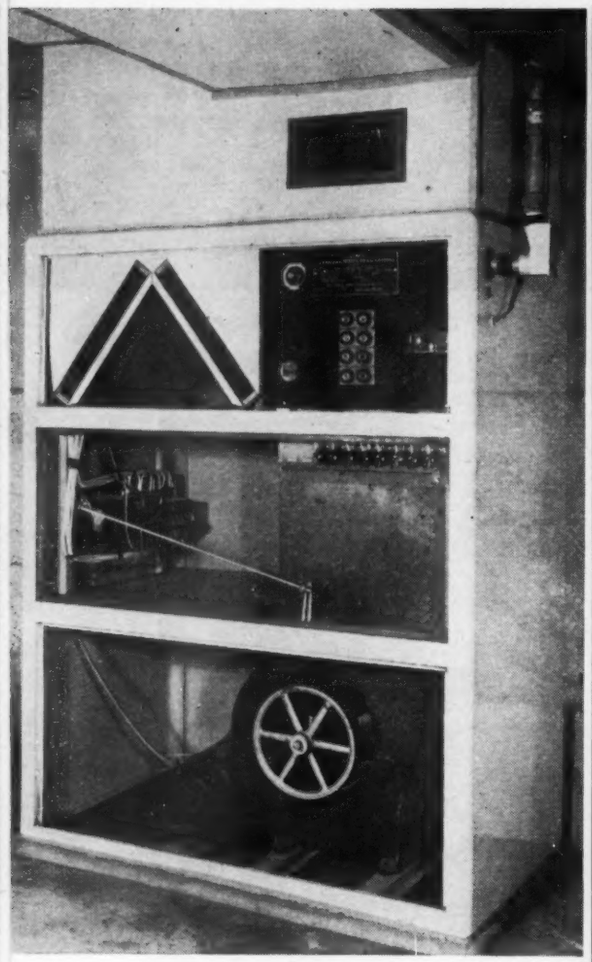
(5) Effect of house-heating load on distribution transformers under conditions of light, medium and heavy load saturation.

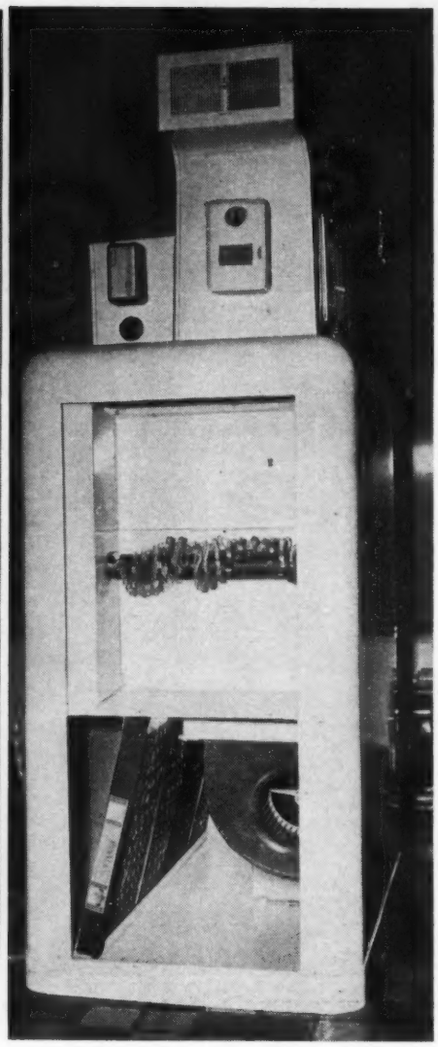
(6) Relation of heating load in terms of both demand and energy consumption to weather bureau temperature records.

(7) Investment requirements and costs of operation which must be assumed by the utility if a substantial house-heating load is encouraged.

Load-Building Possibilities

From the long-range viewpoint, objective of the tests is to investigate and analyze thoroughly all possibilities of service for electric house heating, with a view to future load building at rates which both the customer and the util-





CENTRAL warm air forced circulation furnaces with adaptability to summer air cooling are used. Heating control is in 2-kw. steps. Above is the "Electreat" furnace and at the right the "Montag"

ity can afford. Residential schedules in effect for the past 3½-yr. period have proved that the total connected load of all space-heating units for any single customer should not exceed a rated capacity of 6 kw., except for experimental installations approved by the utility. Under this tariff provision a limited number of electrically heated homes have been served, care being taken to encourage installations only in homes of small or average cubical content, of modern construction, and adequately insulated and weather stripped. The number* of full house-heating installations on PGE lines has grown to more than 300 dwellings and 100 apartments since the initial experimentation was commenced in 1939.

For the present tests 75 of the dwellings having 10 kw. or more of connected heating load and otherwise suitable for test as to location, wiring and adequate home insulation were selected, 68 of them in Portland and vicinity and seven in the city of Salem. Test prospects were listed by name, address, type of heating system employed, total connected heating load, and size of the house in terms of cubical content. All prospects had electric ranges and water heaters in service. Customer reaction was favorable in virtually all cases, and permission to install meters and conduct the tests was readily granted.

Westinghouse Type R-2, Style 1054-184 recording demand watthour meters measuring total load and space-heating load separately in each test dwelling are being used. Special designated meter department personnel are taking the readings and removing charts, leaving the ordinary meter and the routine meter-reading and billing procedure undisturbed. Test meters are being read as nearly as possible to the end of each calendar month to facilitate comparison with weather bureau records of degree-days by months.

Equipment Shortage

Demand and kilowatt-hour data from the charts and special meter books are being tabulated each month for ready totalizing of the sum of the combined loads for (a) total load, (b) space-heating load, and (c) total load less space-heating load. Individual and combined daily load curves will be developed over the critical heating period for such length of time as may be deemed desirable from inspection of the hourly and daily data. All test data will be summarized further by methods of heating, i.e., by central warm air installations and by unit resistance heater installations. Incremental investment, power cost and, finally, total annual cost for serving heating load, will be developed from the data.

In all, 150 recording demand watthour meters and an equal number of current transformers were ordered for the test. War-time shortages prevented the present experimentation, scheduled for several years past, from being carried out earlier. However, considerable data and experience in house-heating were obtained in the interim. Principally, this experience has uncovered a high degree of customer satisfaction with electric heating and demonstrated the technical practicability of the two basic types of heating installations being covered in this winter's tests.

All-Electric Rate

Customer demand for electric house heating, coupled with the utility's experience to date, recently influenced decision to allow the addition of such load on a non-experimental basis under provisions of a new residential and farm schedule made effective jointly by PGE and Northwestern Electric Co. in November, 1945. The rate, offered to so-called "all-electric" customers using electric ranges and water heaters, makes energy available in bulk quantities for an average cost per kilowatt-hour of about 8½ mills. A demand feature applicable to house-heating loads was included to protect the utility from excessive peaks (those above 10 kw. of measured demand).

*Later information is that Portland General Electric Co. is receiving about 50 inquiries a day on house heating from customers. The number of homes and apartments fully heated by electricity has grown to approximately 500.

Some Power Supply Problems At Clinton Engineer Works

Basic service requirements of Tennessee development in atomic bomb undertaking—Electromagnetic plant and residential city of 75,000 inhabitants built at high speed—Quantitative data restricted for security reasons

J. O'R. COLEMAN, Electrical Engineer, Stone & Webster Engineering Corp., Boston, Mass.

THE ENGINEERS responsible for the design and construction of the electric system for the town of Oak Ridge, Tenn., and the adjacent electromagnetic plant at the Clinton Engineer Works were confronted with many interesting and unique problems, which under the pressure of war-time requirements for speed and the constantly changing scope of work required immediate decision.

Stone and Webster Engineering Corp., as Architect-Engineer-Managers for the Clinton Engineer Works, was charged with the selection of the site, design and construction of the electromagnetic plant and for the townsite, among other items, the design and construction of all utilities.

65,000 Population

Originally the townsite was to include dormitories, cafeterias, town center and a limited number of dwellings. The latter number was increased to 1,000 dwelling units on March 24, 1943, which was followed rapidly by authorization for the second and third thousand dwellings. Included in the second stage of expansion were additional dormitories, hospitals, elementary and high schools, churches, theaters, recreation building, laundry, fire and police stations, stores, shops, post office, banks, service stations and other types of auxiliary structures necessary for the wellbeing of 20,000 or more people. As requirements for personnel increased, those facilities were increased to accommodate a population of 65,000 including 8,500 children of school age. The final stage of expansion, adding facilities for 10,000 additional people, was supervised directly by the U. S. Army Corps of Engineers.

For security reasons all that can be said of the loads in the electromagnetic process buildings at this time is that these were of such a nature that individual three-phase 154-kv. transformers were required for each unit of the plant. The largest single units of load were 8,400-hp., 13.2-kv., 3-phase synchronous motors which were started across the line.

Standard Equipment Favored

In connection with the design and construction of the power supply for the Clinton Engineer Works the following basic principles applied:

Reliability—The system must provide a maximum reliability without the use of alternate feeders, transformers or other equipment.

Simplicity—The system must be simple as the number of experienced operators would be limited.

Critical Material—The amount of critical material used throughout must be held to a minimum.

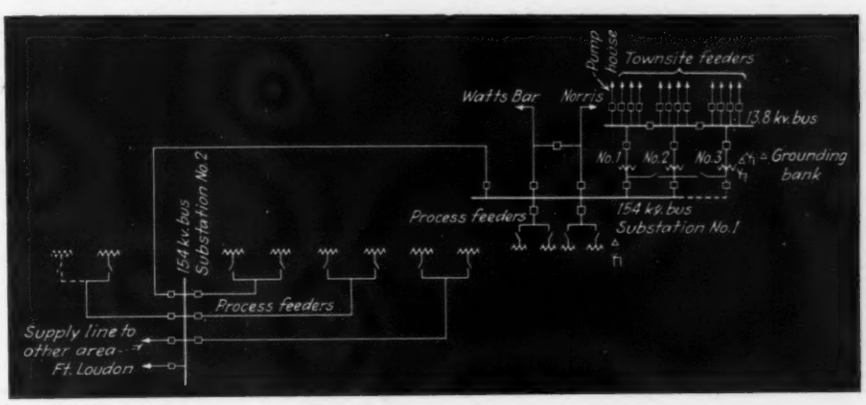
Flexibility—The system must be so designed as to provide the greatest flexibility for changing requirements.

Standard Equipment — Standard equipment must be used wherever possible in order to speed up delivery.

As soon as an approximate magnitude of the load to be served was determined, agreement was reached with the Tennessee Valley Authority that the best way for supplying this load in the minimum time was to cut the Watts Bar-Norris 154-kv. transmission line adjacent to the project and loop it through a high-tension switching station. Substation No. 1 was developed to supply the initial electromagnetic plant and the townsite. This station contains the control by 154-kv. breakers and step-down transformers and control of townsite feeders.

Wood Poles Used

As the load increased with added process facilities, an additional substation was established about 1.5 miles from the first substation, a tie line being run between the two stations and a high tension feeder from Fort Loudon installed. A supply line to another process area was first connected to substation No. 1 and later relocated to



MAIN POWER supply to townsite and processing plant

substation No. 2 as the load in the other area developed.

In order to save steel, wood poles were used entirely for supports of switches and buses in both of these substations.

Power Supply

The townsite transformer No. 1 is wye-connected with grounded neutral on the high-tension side and delta-connected on the low-tension side, with a wye-delta transformer bank connected solidly to the secondary of this main transformer. The main process transformers are delta-wye with the secondary neutral grounded. This arrangement of transformers provides:

(1) A ground point of limited capacity for the high-tension system required for relaying.

(2) A neutral ground with fault current limited to 600 amp. for the 13.2-kv., 3-phase, 4-wire distribution system.

(3) Power from the 460-volt secondary of grounding transformer for substation auxiliaries and lighting.

(4) Solid neutral grounds for the process building supplied.

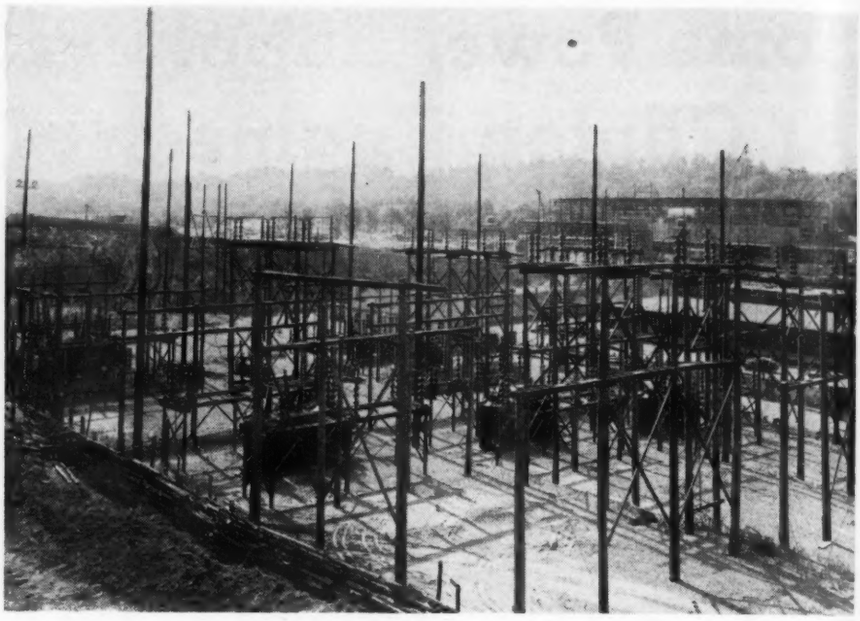
(5) Zero phase displacement between secondary systems.

The process buildings are supplied by feeders from the two substations. Two main transformers are connected to each feeder through load-break disconnect switches. Disconnect switches are installed for bypassing all breakers to allow for servicing without interruption. The process buildings extend east and west for a distance of nearly 1.5 miles.

The initial transformer purchased for the townsite had a rating of 9,000 kva. with provision for adding radiators to increase its self-cooled rating to 11,000 kva. with an ultimate rating of 15,000 kva. with fans. As the townsite load increased, additional radiators and fans were added to transformer No. 1. Then a duplicate unit was installed for transformer No. 2 and with further increased load transformer No. 3 was added. Disconnects are provided for grounding only one transformer at a time.

Breakers

The initial high-tension breakers had an interrupting rating of 2,500,000 kva. With the requirements for additional capacity the next group of breakers installed had an interrupting rating of 3,500,000 kva. Later the original breakers were rebuilt to provide for the higher rating.



SUBSTATION NO. 2—Creosoted pine poles were used for 154-kv. structural designs, to save steel and speed up construction, similarly as in substation No. 1

The 13.8-kv. breakers have an interrupting rating at 250,000 kva. and an alarm is provided to prevent the closing of both bus tie breakers and all three main breakers simultaneously.

No Regulators for Townsite

It should be noted that no regulators are provided in the circuits supplying the townsite. Although this is contrary to usual practice it was done in accordance with war-time restrictions and the voltage supplied to the townsite has been satisfactory.

Relaying Scheme

Carrier relaying and distance relaying are provided on the Watts Bar, Norris and Fort Loudon lines, matching the TVA relays at the sending end of these lines. The process feeder lines are provided with overcurrent, ground and harmonic restraint relays. All transformers, the tie line and both buses are equipped with differential relays using pilot wires. The line to the other area is equipped with carrier and distance relays.

The 13.8-kv. system is provided with phase and ground relays but no bus differential.

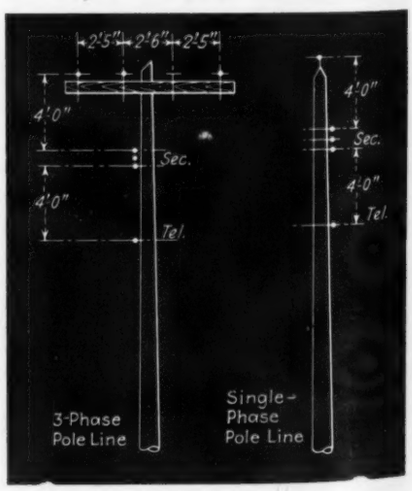
Primary Metering

Meters are provided on each incoming line for measuring the incoming and outgoing kilowatt-hours, kilovars and kilowatts. These measurements are transmitted to substation 1 and summarized. The total demand is transmitted to the TVA dispatcher at Watts Bar by carrier.

Townsite Electrical System

Individual residential units were provided with electric ranges, water heaters and refrigerators in addition to lighting and convenience outlets. The apartments have other means for water heating and trailers and huts ments in general have only lighting and small appliances. Stores, theaters, etc., had the usual lighting and power requirements of such establishments.

Distribution in the townsite is 3 phase, 4 wire, 13.2 kv. with common



TYPICAL single and three-phase distribution line construction, Oak Ridge

Residential Loading Range, Refrigerator, Water Heater, Lighting and Appliances; Not Metered; January Day

Number and Type of Houses		Transformer Kva.	Transformer Av. Daily	Loading Maximum	Demand on Trans. Per Residential Unit
13	A6	25	11.5	33.6	2.6
16	A6	25	12.7	26	1.6
16	TVA	25	16.7	30.7	1.9
18	TVA	25	17.2	36.0	2.0
19	TVA	25	21.3	35	1.9
20	TVA	25	20.4	40	2.0
21	TVA	25	26.4	46	2.2
20	TVA	25	20.5	38.4	1.9
11	TVA	25	11.4	22.4	2.3
13	TVA	25	15.3	28	2.2

neutral. The main feeders from the substation are No. 2 copper with 3-phase subfeeders of No. 4 copper connected through fuses and single-phase branches of No. 8 three-strand copper weld. This general arrangement was, of course, varied to meet special conditions and also the wire size was varied to use available material. These were, of course, varied for two circuits where needed and also to meet special conditions.

Secondaries

For residential distribution in this completely electrified (middle class, without rich or poor) city of 75,000 population, 25-kva., 7,620/120-240-volt transformers were adopted as standard with No. 2 secondaries and No. 4 neutral. The transformers are located in the approximate centers of the secondary and the load feeds in both directions.

No Residential Meters

For completely electrified homes, i.e., homes containing, in addition to house lighting and small appliances, ranges, water heaters and refrigerators, the best available data indicated that the transformer demand would be approximately 1.5 kw. All of these data were based on individual metering and normal working conditions. However, this townsite was built for a three-shift plant where the diversity would be different from a normal residential load and no residential meters would be used due to war-time restrictions. Billing for utility services was on a flat rate basis. In view of these conditions it was estimated that the average demand would be approximately 50 percent greater than the available data indicated. On this basis the distribution system was originally laid out with 12 to 15 houses connected to each 25-kva. transformer. The layout was made so that as experience developed, overloading could be taken care of by transferring service connections from one secondary to another or by the use of a limited number of 37.5-kva. transformers.

Commercial Metering

Commercial loads were metered and billed in the usual manner. Actual observations of residential transformer loading for a limited number of secondaries are shown in the above table. It should be noted that with the rapid expansion, houses were added without regard to transformer loading. This situation has been corrected.

For stores, dormitories, apartments and other special loads, transformers selected to meet the individual load or groups of loads were used and 3-phase, 4-wire 120/208-volt secondaries provided where necessary. Development of the townsite load is shown herewith. Due to curtailment of activity, the townsite peak in December, 1945, was only 29,548 kw.

Townsite Load-Factor 60 Percent

The kilowatt-hour consumption and the maximum demand by months from January, 1945, to August, 1945, are shown in the table below. It will be noted that the monthly load-factor of the townsite is about 60 percent.

Telephone Joint Use

The distribution poles are also used for the telephone circuits. Where cable circuits are used the cable sheath is grounded to the multigrounded power neutral and no additional special protection provided. For open-wire circuits a Bell system No. 99A protector is installed at each service drop and this protector grounded to the power neutral.

Street and Fence Lighting

Parallel street lighting supplied from the residential distribution system and controlled by a pilot wire run along with the secondary wires is used in the townsite series.

Extensive protective fence lighting was required around the operating area. Two series circuits supplying alternate lights were used for this service. The two circuits are supplied from separate primary sources. The series transformers are controlled by the guards.

Total Townsite Load

	Consumption kw.-hr.	Demand Maximum kw.	Monthly Load Factor
January, 1945	12,262,000	27,500	0.60
February	11,008,000	26,500	0.62
March	10,938,000	24,000	0.61
April	10,355,000	24,000	0.60
May	10,732,000	25,000	0.58
June	9,442,000	23,000	0.57
July	9,468,000	19,000	0.67
August	9,765,000	21,000	0.63

TOWNSITE LOAD nearly quadrupled in first year of development, reaching 27,200 kw. in December, 1944; curtailed activity made December, 1945, peak less than expected

Electronic Exciter for 81,250-Kva. Turbo-alternator

Ignitron, designed for electrically isolated generating unit, to be worked initially on smaller unit—Firing control by thyratron—Tests indicate high speed of response and practicability for intended application

H. A. P. LANGSTAFF and R. F. LAWRENCE†*

EXTENDED USE of ignitron rectifiers during the past years has established them as a reliable and efficient means of converting a.c. to d.c. power. The d.c. power required for excitation of synchronous generators, condensers and motors for the majority of installations has been supplied by direct-connected exciters or motor-generator sets. However, rectifiers have been used for this purpose on one or two small generators, on one large synchronous condenser and on several synchronous motor applications. There has been some hesitancy in applying them to an installation as important as a large a.c. generator because of the natural reluctance to anything which might involve risk to reliability or performance of anything so important as a large a.c. generator.

An electronic exciter recently was installed in the Springdale Station of the West Penn Power Co. This station consists of five 1,800-rpm. turbine generators having motor and dual driven exciters. There is also one 50-mva., 3,600-rpm. high-pressure unit with a direct-connected exciter. The new No. 7 unit, which is an 81,250-kva., 3,600-rpm. generator, is practically an isolated station electrically with no paralleling of circuits other than at 132 kv. Only a few of the auxiliaries for this unit are supplied from the existing 2,300-volt auxiliary bus. A shut-down would be very costly. In order to eliminate shut-down caused by exciter trouble, which might necessitate mechanical disconnection from the shaft of the main unit, an electronic type exciter was selected. The electronic exciter was designed to serve eventually as the main exciter for the new No. 7 unit. Initially it will supply excitation to one of the 25,000-kva., 1,800-rpm. turbine generators, and one of the existing motor-driven exciters will excite the new No. 7 unit. Provision is made for supplying excitation to any one of the generators from any exciter through excitation buses, as shown in the schematic diagram of the Springdale Station in Fig. 1.

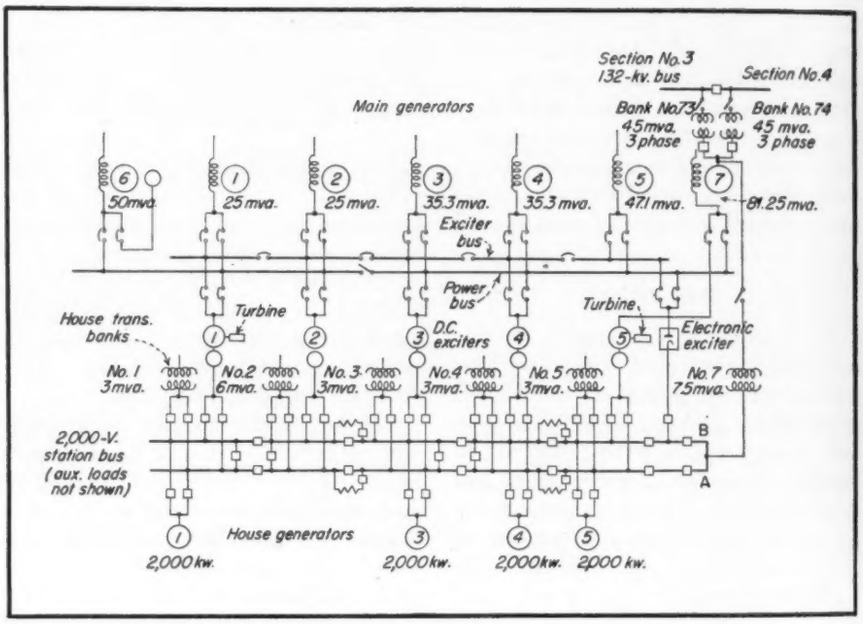


FIG. 1—Springdale Power Station exciter system and auxiliary power sources

Rectifier and Regulator

The electronic exciter consists fundamentally of a rectifier transformer, a power rectifier and a voltage regulating circuit. In addition, there are associated equipments including series compensators, a grid transformer, an auxiliary anode transformer, protective fuses, anode breakers, a cathode breaker, a heat exchanger, relays and indicating instruments. Fig. 3 is a schematic diagram of the electronic exciter. The a.c. cubicle contains fused disconnect switches, connecting the a.c. supply source to the rectifier transformer and to the 10-kva. auxiliary transformer. The rectifier transformer housed in a metal cubicle is an air-cooled, delta, 6-phase star transformer. The high voltage winding has two tap positions so that with the winding connected on the high tap, a normal no-load d.c. ceiling voltage of approximately 300 volts is obtained from the rectifier; with this winding connected on the low tap, an abnormally high d.c. ceil-

* Electrical Engineer, West Penn Power Co., Pittsburgh, Pa.
† Central Station Engineer, Westinghouse Electric Corp., East Pittsburgh, Pa.

ing voltage of approximately 400 volts is obtained from the rectifier.

The generator will operate essentially self-excited, in which case power is supplied to the rectifier from the generator. The rectifier is subject to voltage dips at the generator terminals. The purpose of the abnormally high rectifier output was to provide a means of compensation for voltage dips caused by disturbances such as faults on the 132-kv. system. The rectifier was designed to produce normal d.c. ceiling field voltage with 75 percent a.c. voltage supplied. The transformer will be connected to give the higher d.c. rectifier output.

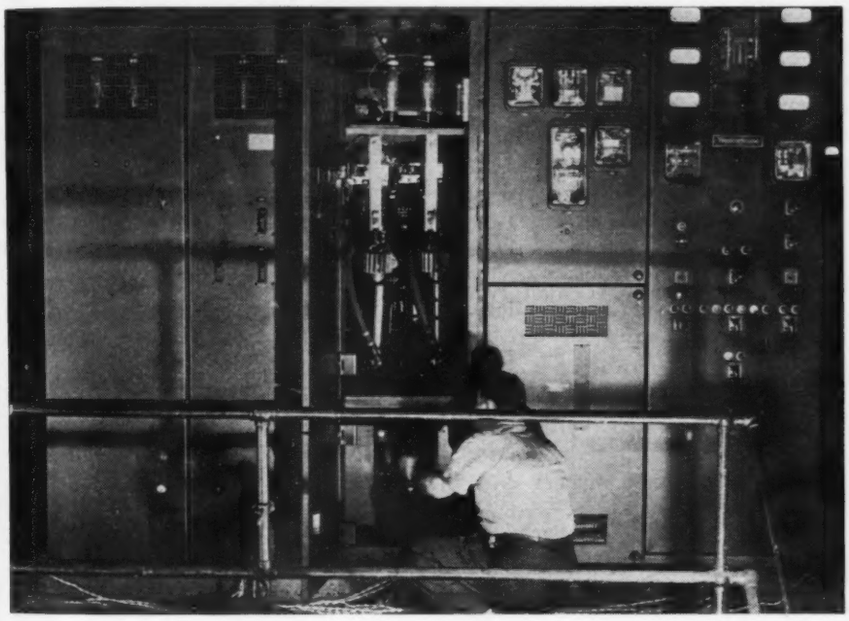


FIG. 2—Electronic exciter embraces a rectifier transformer cubicle (not shown), the d.c. cubicle, and the control cubicle, the latter installed in the Springdale control room

Alternative Compensation

A second method of compensation which can be used is to provide series compensators, the primaries of which are connected in series with each phase of the generator and the secondaries connected in series with the rectifier transformer. The voltage boost obtained is in proportion to the reactive current fed from the generator. Series compensators were built for use with the electronic exciter on the No. 7 unit. They were designed to give a compensation of 50 percent with an initial transient current of 25,000 amp. through a one-turn primary. This is the value of generator current for a 3-phase fault on the high voltage terminals of the transformers connected to the No. 7 unit. For this condition the generator terminal voltage would drop instantly to approximately 50 percent. In the tests which were made, the compensators did not give the compensation desired and they were not installed.

The electronic exciter could be separately excited by supplying power to it from a reliable a.c. source, such as a separate station auxiliary generator or an auxiliary generator mechanically connected to the shaft of the main generator. For this condition, system disturbances would not affect the output of the rectifier and no series compensators would be necessary. Only one tap position would be required on the rectifier transformer to give a normal d.c. rectifier output with 100 percent a.c. voltage applied.

Rectifier Cubicle

The rectifier cubicle is divided into three separate sections, each having two ignitron tubes and two thyratron tubes. The two ignitron tubes per section are connected through a single two-pole breaker to diametrically opposite phases of the rectifier transformer. The cathodes of these two tubes are connected through a single-pole, two-position knife switch to the positive terminal of the d.c. cathode breaker. The thyratron filament transformers, the auxiliary anode transformer and the grid transformer are located in the rectifier cubicle.

Each pole of the anode breakers is equipped with a reverse current trip attachment providing for automatic tripping on ignitron arc-back. Automatic reclosing on each breaker is provided by means of a three-shot recloser relay. This relay will close any one or any pair of anode breakers at time intervals, the first of which may be instantaneous. A second single-shot recloser relay closes all three breakers on simultaneous tripping. The anode breakers are operated manually by a mechanical switch in the control cubicle.

Protective Interlocks

A system of mechanical and electrical interlocks is provided for protection of the operators. Any one of the three sections of the rectifier cubicles can be deenergized so that tubes can be changed or other maintenance work can be done with the exciter still in operation. The rectifier can supply full load field excitation for two hours with four tubes in service; with only two tubes in service, the rectifier can supply full load field excitation momentarily and no load field excitation continuously.

Ignitron Firing Control

The control cubicle contains indicating instruments for reading the rectifier input, output and d.c. grid bias voltage. It also contains the voltage regulator which controls the firing delay of the ignitron tubes. The anodes of each ignitron tube and its associated thyratron tube are connected in parallel and the cathode of the thyratron is in series with the ignitor of the ignitron tube. Firing of the thyratron, and consequently the ignitron, is controlled by superimposing a d.c. grid bias voltage on the a.c. grid voltage wave of the thyratron tube. The a.c. grid voltage lags the a.c. plate voltage by 120 deg. The point at which the grid voltage intersects the critical grid bias characteristic of the thyratron tube determines the firing delay. Depending upon the d.c. grid bias, the thyratron tube is made to fire at any value of delay from 0 deg. to full delay.

The d.c. grid bias which is applied is the algebraic sum of a fixed positive voltage and a variable negative volt-

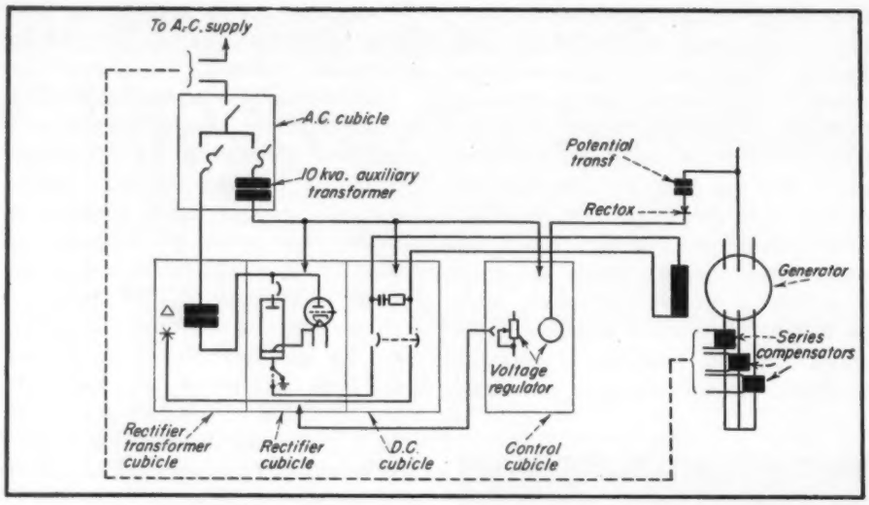


FIG. 3—Electronic exciter comprises rectifier transformer, ignitron, voltage regulator and auxiliaries such as temperature controls, annunciators, heat exchanger and pump

age. The negative voltage is the voltage drop across a variable resistance in the voltage regulator. The voltage regulator is the direct-acting type, having a pivoted armature which opens and closes silver button contacts connected to taps on the regulating resistance. The position of the armature is determined by a voltage coil which is energized from a Rectox rectifier and supplied by potential transformers connected to the generator terminals.

A group of annunciator targets for indicating anode breaker tripping, ignitron overtemperature or misfire and rectifier transformer overtemperature are also located on the control cubicle.

The d.c. cubicle contains a 1,200-amp. draw-out type air circuit breaker which serves as a cathode breaker. There is no overload trip attachment on this breaker. The upper portion of this cubicle contains auxiliary relays for protection of the thyratrons so that they will not be operated until the filaments are heated. Auxiliary relays are provided for automatic changeover to an emergency supply for the thyratron filaments and the grid transformer in the event of the loss of auxiliary power. The instantaneous and timed reclosure relays for reclosing of the anode breakers are contained in this cubicle.

A water-to-air heat exchanger is provided and consists of a motor-pump, a radiator, a fan and a water temperature relay which controls the temperature and rate of flow of the ignitron cooling water. An illustration of part of the electronic exciter is shown in Fig. 2.

Laboratory Tests

In order to obtain complete performance data on the electronic exciter for operating conditions which might occur in service but which could not be readily staged on the actual installation, extensive tests were run in one of the a.c. high power laboratories. The laboratory test set-up simulated the actual installation insofar as possible. The laboratory consists of a 3,300-hp. motor driving two 20,000-kva. generators which are synchronized mechanically and electrically. Facilities are available for applying any type of fault through 0 to 5 ohms reactance. Zero-power factor lagging reactive load can be applied by paralleling the two generators with one underexcited. Provision was made for self- or separate excitation of the generator. For self-excitation, the rectifier transformer was connected through a 450-kva. auxiliary transformer to the generator terminals. The generator was connected in wye for 6,600 volts line-to-line. The series compensators were connected so that tests could be made

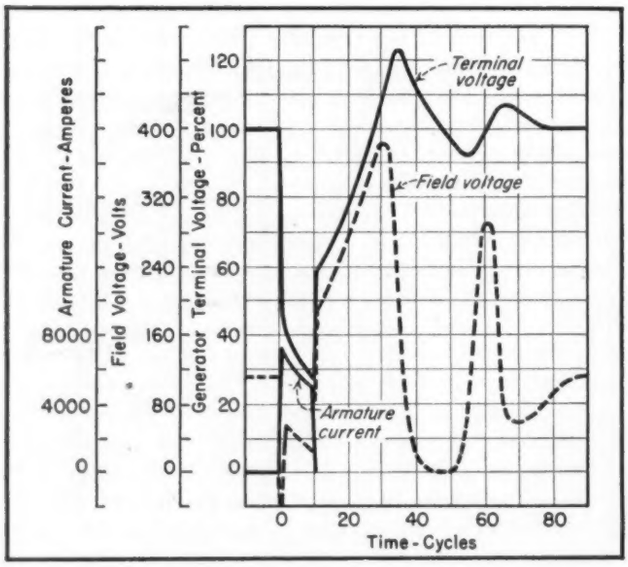


FIG. 4—Three-phase, 10-cycle fault applied on 20,000-kva. laboratory generator through 10 percent external reactance. Generator was self-excited and rectifier transformer was connected to give the maximum rectifier voltage

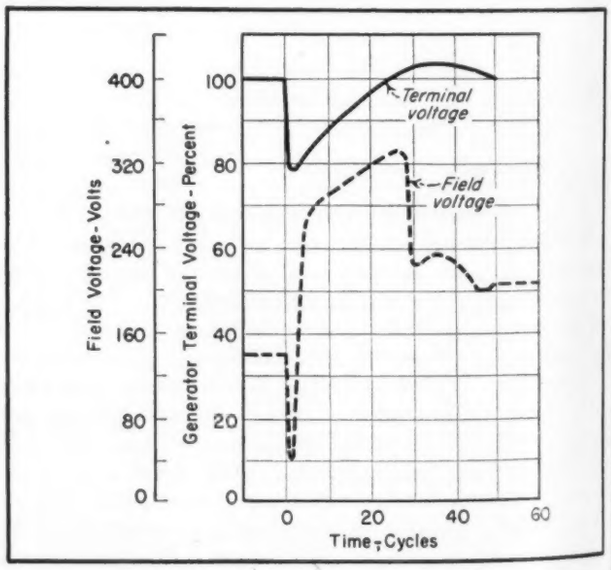


FIG. 5—Application of 60 percent zero power factor lagging reactive load on 20,000-kva. generator. Generator was self-excited and rectifier transformer was connected to give the maximum rectifier voltage

with or without them in the circuit. The initial transient current from the laboratory generator for a three-phase fault through 10 percent (20,000-kva. base) external reactance is approximately 8,750 amp. With three turns through the primary of the series compensators, 26,250 amp.-turns were obtained. This gives approximately the same number of ampere-turns that would be obtained on the No. 7 unit for a 3-phase fault on the high voltage terminals of the step-up transformers.

Tests of Wide Range

The tests consisted of the application of all types of faults, application and dropping of reactive load, changeover from self-excitation to separate excitation, simulated arc-backs and "build up" of generator terminal voltage. With no compensators tests were run with the generator self-excited, with the rectifier transformer connected to give the maximum d.c. rectifier voltage; generator self-excited with rectifier transformer connected to give the lower d.c. rectifier voltage; generator separately excited with the rectifier transformer connected to give the lower d.c. rectifier voltage. Tests were run with the compensators connected into the circuit, with the generator self-excited and with the rectifier transformer connected to give the lower d.c. rectifier voltage.

In order to obtain data for comparison of the performance of an electronic exciter with a rotating exciter, tests were also run using a rotating exciter with a high-speed field forcing contactor to simulate the use of a rheostatic type voltage regulator. Oscillographic records of generator terminal voltages, line currents, field voltage, field current, grid bias voltage, rectifier transformer primary voltages, ignitron tube anode to cathode voltages, and ignitron anode currents were obtained for all tests involving the electronic exciter. For the tests on the rotating exciter, only the generator terminal voltages and currents, field voltage and current were recorded. A total of 89 tests, for which oscillographic records were taken, was run.

Faults Simulated

Fig. 4 shows curves of generator terminal voltage, armature current and field voltage versus time for a ten-cycle, 3-phase fault through 10 percent external reactance. This is representative of a severe fault with modern high-speed circuit breaker clearing time. It also simulates a fault on the high voltage terminals of the transformers connected to the No. 7 unit at Springdale. In Fig. 5 are shown curves of generator terminal voltage and field voltage versus time for application of 60 percent reactive load. The curves in these figures were plotted from oscillograms. Comparison of the performance of the electronic exciter with a rotating exciter for application of 60 percent reactive load shows that the electronic exciter returned the terminal voltage to a constant value of 100 percent in about 50 cycles. With the rotating exciter, the terminal voltage was returned to 100 percent in 70 cycles. Because a voltage regulator was not used on the rotating exciter, the time required to return the voltage to a constant value of 100 percent was not obtained.

Compensator Test Results

Test results showed that the performance of the electronic exciter with and without the series compensators was about the same. This was primarily due to the high voltage regulation in the a.c. supply circuit to the rectifier. The high regulation was a result of the high field current requirements of the test generator and the high reactance of the auxiliary transformer (450 kva. compared to 7,500 kva.) between the generator terminals and the rectifier. The full load field current of the test generator is approximately 1.67 times that of the No. 7 unit. The data and results obtained from these tests provide valuable information that could not be obtained in actual service even over a period of many years.

Characteristics Confirmed

The electronic exciter can be maintained while in service; it has an inherent high speed of response; the cost of the electronic exciter is higher than that of a rotating machine. An a.c. generator self-excited could be operated as an independent unit in an isolated station. Tests showed that an external voltage source of approximately 15 percent of full-load field voltage would cause the rectifier to start firing and build up the generator terminal voltage. The external source could be tripped off automatically by a reverse current relay. This external voltage source could be a small mg. set or a battery. The extensive laboratory tests, based on pessimistic conditions that are unlikely to be matched in actual service, demonstrated that the electronic exciter can be depended upon as a reliable source of excitation for large a.c. generators.

• • •

Electricity Outputs in Great Britain

After suspension of their publication during the war period, data on production of electricity in Great Britain have been made generally available again. The accompanying tabulation of monthly and annual outputs is reproduced from the *Electrical Review* (London, England) of November 2, 1945. The figures for the twelve months, October, 1944, to September, 1945, are subject to revision. Cumulative amounts are listed at foot of table.

Month	Electricity Generated by Authorized Undertakers in Great Britain (in millions of kw.-hr.)							
	1938	1939	1940	1941	1942	1943	1944	1945
January	2,382	2,704	3,018	3,145	3,616	3,437	3,712	4,174
February	2,145	2,334	2,658	2,725	3,323	3,075	3,594	3,295
March	2,111	2,508	2,451	2,867	3,370	3,306	3,691	3,383
April	1,849	2,046	2,347	2,632	2,860	2,854	2,886	2,926
May	1,854	2,068	2,194	2,593	2,741	2,894	2,924	2,812
June	1,612	1,912	2,036	2,230	2,577	2,641	2,745	2,652
July	1,656	1,918	2,152	2,287	2,566	2,648	2,605	2,537
August	1,679	1,885	2,076	2,320	2,461	2,645	2,606	2,474
September	1,868	1,897	2,056	2,480	2,675	2,932	2,919	2,707
October	2,195	2,225	2,450	2,858	2,976	3,248	3,332	
November	2,346	2,350	2,559	2,993	3,186	3,522	3,597	
December	2,675	2,563	2,778	3,236	3,300	3,747	3,744	

Cumulative 24,373; 26,409; 28,776; 32,369; 35,654; 36,951; 38,354 for year.

Organized Substation Inspection

Scheduled inspection and maintenance of substations, capacitor installations and transformer vaults on a representative distribution system insure thorough coverage of conditions — Check-up forms are outlined

SCHEDULED maintenance practice on the distribution system of an eastern power system serving between 50,000 and 75,000 meters includes carefully prepared routines covering inspections and records of substations, capacitor installations, transformer manholes and vaults. The company's maintenance supervisor is responsible for such inspections and for keeping proper records of these and of other operations at such places. The term substation embraces all installations energized from the 13.2-kv. system.

The record consists of "Routine Inspection Reports" and "Apparatus Repair Records" for each individual substation, capacitor installation, transformer manhole or vault where moving machinery is installed. Such reports are not required for manholes or vaults not containing moving machinery. All such reports are turned in promptly to the maintenance supervisor, who, after examining them and taking necessary action, signs them as "Approved for Filing."

Routine Inspection Report

Individual forms are provided for the principal substations, since these are likely to vary materially in electrical layout. A general form is used at all other substations or capacitor installations. A special form provided for transformer manholes and vaults with moving apparatus is used for these places. Every space is required to be filled in, using a dash where requested information does not exist.

Maximum demand readings are required to be made before the ammeter jack or other connection is disturbed. Maximum demand instruments are ordered to be shifted weekly in the following order, A to B to C to A, etc. The "in-wire" report must be as found. Counter readings must be as found, and if for any reason the switch is operated by the inspector both "as found" and "as left," readings are required to be given. In Westinghouse type relays the numbers of the fingers (reading from left to right facing the relay) are given, and in General Electric relays the lockout contacts are reported as open or closed.

The test for 24 volts direct current, as shown on the forms, is required to be made on the trip coil side of the

DISTRIBUTION DIVISION

ROUTINE INSPECTION — SUBSTATION

Time Arrived ..... A.M. P.M. Left ..... A.M. P.M. Date ..... 19 ....

	4.6 KV. CIRCUITS					
	Bus Tie	343	350	344		
Volts AB						
Volts AC						
Volts BC						
Amperes A						
Amperes B						
Amperes C						
Max. Demand In Wire						
Counter Reading						
Target	Red Green (M)	Red (M) Green	Red (M) Green	Red (M) Green	Red (M) Green	
Indicating Lamp on Breaker	Red Green (M) Off	Red (M) Green Off	Red (M) Green Off	Red (M) Green Off	Red (M) Green Off	
Reclosing Relay Contacts	Lockout Open (M) Closed	Lockout Open (M) Closed	Lockout Open (M) Closed	Fingers	Lockout Open (M) Closed	
Relay Targets Trip	Yes No (M)	Yes No (M)	Yes No (M)	Yes No (M)	Yes No (M)	
Test for 24 Volt D.C.	Alive Dead	Alive Dead	Alive Dead	Alive Dead	Alive Dead	
Switch House Lights						
Heater	On Off	On Off	On Off	On Off	On Off	
Oil Level in Breaker						
Roof and Breaker Bushings						

	REGULATORS								
	AB	BC	AB	BC	AB	BC	AB	BC	
Oil Level									
Control Switch	On Off	On Off	On Off	On Off	On Off	On Off	On Off	On Off	
Position +									
Position −									
Operation in 2 Directions									
Three Position Switch	N = Neutral A = Auto. M = Manual						N. A. M.	N. A. M.	

	13.2 KV. CIRCUITS	
	H.T. 33	H.T. 37
White Indicating Lamps	On (M) Off	On (M) Off
Targets	Red (M) Green	Red Green (M)
Safety Lock Switches	Open Closed (M)	Open Closed (M)
Heater	On Off	On Off
General Condition of Airbreak		
A.B. Operating Handles	On Hand Missing	On Hand Missing
27-1	top (M)	
27-2 Relay Closed to	bottom	
#2 Time Relay-Relay	Reset (M) Not Reset	
#25 Synch. Relay	Open Closed (M)	
#4 Relay Closed	Up (M) Down	
#43 Switch	Manual Auto (M) Off	
Condition of 13 KV Fuses		

STATIC CONDENSER

Oil Switch	Open Closed
General Condition	

STATION TRANSFORMERS

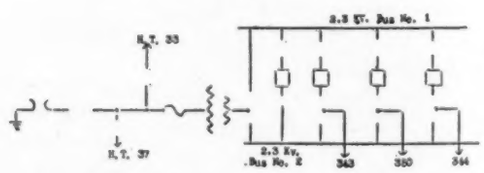
	No. 1	No. 2	No. 3
Max. Temp °C			
Temp. Indicator Reset	Yes No	Yes No	Yes No
Oil Level			
Condition of Bushings			
General Condition			

Signed ..... Inspector

Approved for Filing ..... Maintenance Supervisor

SUBSTATION

SWITCH POSITIONS



Report Oil Switch thus:- . Open ☐ Closed ☒

Report disconnecting switch thus:- Open — — Closed — — —

A report by the Inspector that a disconnecting switch was found closed is considered a statement that it was found to be properly closed and latched

STORAGE BATTERY

Cell No.	1	2	3	4	5	6	Tray	7	8	9	10	11	12	Tray
Volts														

Air Temp. °F. Electrolyte Level Charging Amps. Water Added Yes No

GENERAL CONDITIONS (Mark 'O.K.' or X)

2.3 KV. Bus Clear of Ground	A	B	C
Potheads	St. Lights Outlits		Fence Yard Etc.
Lightning Arrester	S & C Fuses (2.3 KV)		Station Lights
Supplies on hand as per list	Telephone		Bus Insulators
Watthour Meters	Operating Handle for 2.3 Kv. Oil Switches	On Hand Missing	Fire Extinguishers
			Tank Lowering Device

REMARKS - (Give details of any abnormal condition)

EXAMPLE of inspection record form with single line wiring diagram for a particular substation

fuses in each individual switch house, using the special tester provided. Switch house lights must be turned on and every bulb actually seen by the inspector.

The heater is tested by feeling the heater itself and not by merely observing the position of the heater switch. All oil levels are reported as plus or minus so many inches from the normal oil level as marked on the gauge. In case the gauge leaks or is empty or otherwise not in good condition, an X mark is made in the corresponding space and the condition described under remarks. Storage batteries are inspected and maintained in accordance with routine instructions issued to inspectors. A quick visual inspection is required of all features connected with the street lighting equipment.

The general condition of bushings, switches, potheads, fire extinguishers or anything else in the installation is required to be reported as "O.K." or "X." An "O.K." report's meaning is obvious. An "X" report indicates that the apparatus was not found in a satisfactory condition, and is required to be explained under "Remarks," stating the action taken, if any. Every pothead must be seen and any cracked bushings, compound leaks, peeling insulation or other unsatisfactory condition reported.

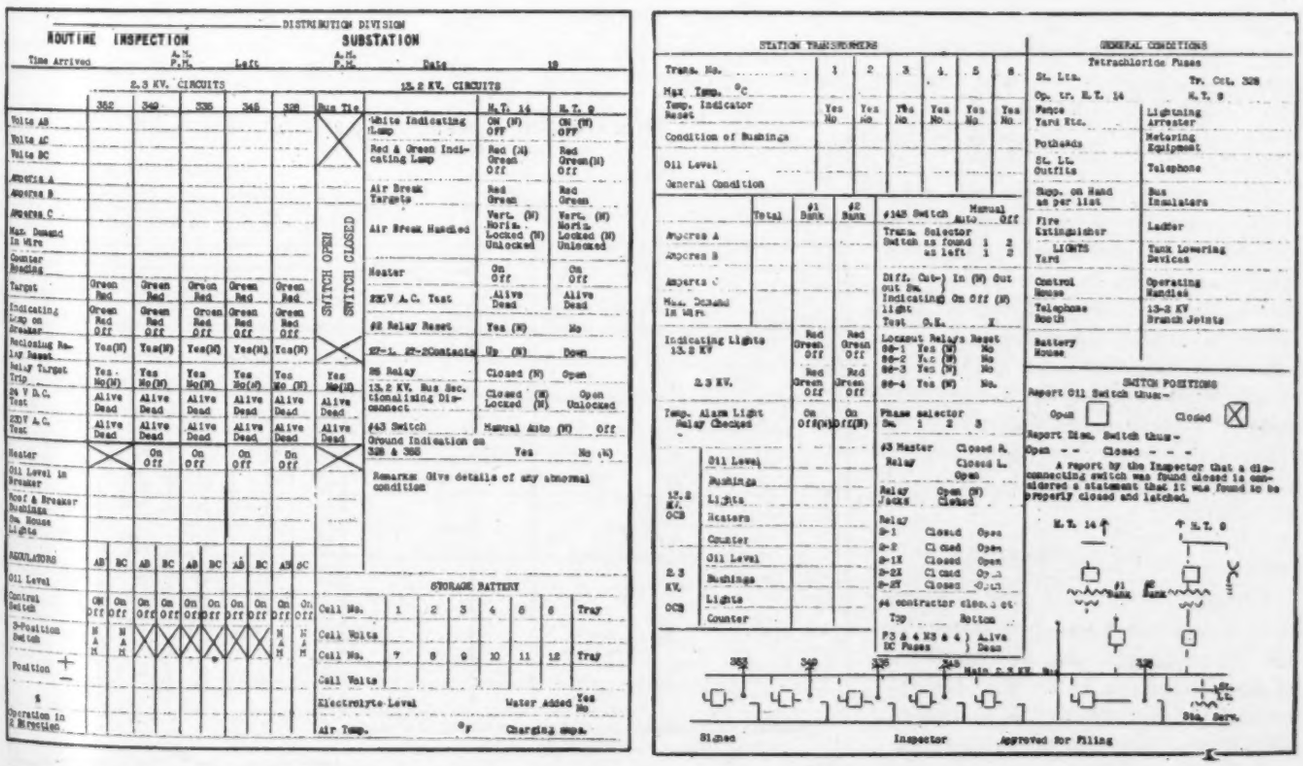
All yard and telephone booth lights are required to be turned on during inspection and every light actually seen. Each tetrachloride fuse is given visual inspection for liquid level and color of liquid, and any unsatisfactory condition, no matter how slight, is reported. Lightning arresters are given a quick visual inspection for connections, gap spacing, etc. Every bus insulator must be seen and any cracked or damaged units reported. This includes insulators on disconnecting switches and other insulators not definitely covered elsewhere. In every substation is a printed list of supplies required to be on hand, and this list is checked by the inspector and any missing items reported for replacement. Telephones are tested by calling up the maintenance supervisor. Fire extinguishers are examined weekly for liquid level and on the first visit every month are tried in actual operation. Watthour meters are checked for direction of rotation and lighted potential lamps, if any. Fences are carefully examined and any defects reported, and any necessary cleaning, weeding, grass cutting or other maintenance about a yard or structure recorded. On branch joints oil leaks, deformation of sleeves or other defects are reported.

An apparatus repair record is made out by the inspector to cover every case in which he discovers that repairs, cleaning, or other work is necessary which he cannot perform during the inspection.

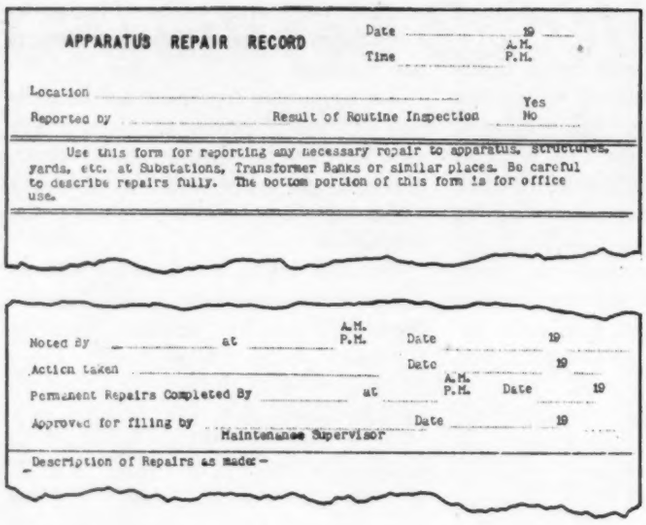
On receiving such a sheet the maintenance supervisor fills in the line beginning "Noted by," and then takes the necessary action (Work Order, Trouble Report, etc.) to have the necessary repairs made and fills in the line, "Action Taken." When the work is finished, he fills in the line, "Permanent Repairs Completed By," and the space headed, "Description of Repairs as Made." When he is convinced that the repairs are satisfactory, he fills in the line beginning, "Approved for Filing By," and files the apparatus repair record immediately behind the routine inspection form from which it originated. Until this is done the apparatus repair record remains in a prominent position on the maintenance supervisor's desk.

Substation Operation Report

A copy of this form is made out to cover any operation, inspection, clean-



ANOTHER EXAMPLE of report form showing the effect of differences in layout on the inspection details necessary



APPARATUS REPAIR RECORD

Date ____ 19 ____
Time ____ A.M. P.M.

Location ____

Reported by ____ Result of Routine Inspection ____ Yes ____ No

Use this form for reporting any necessary repair to apparatus, structures, yards, etc. at Substations, Transformer Banks or similar places. Be careful to describe repairs fully. The bottom portion of this form is for office use.

Noted By ____ at ____ A.M. P.M. Date ____ 19 ____

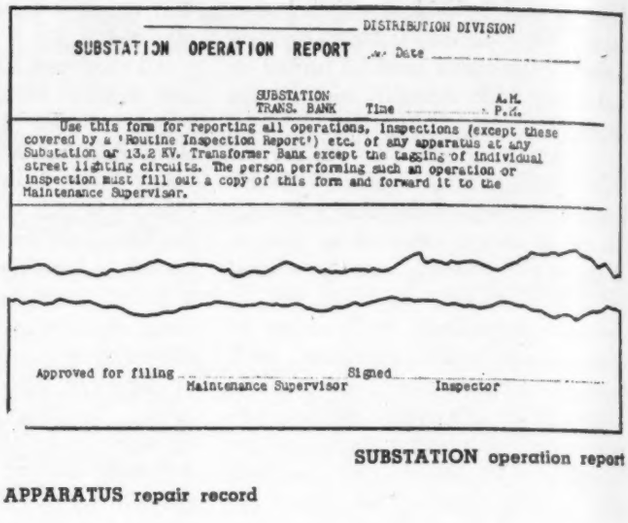
Action taken ____ Date ____ 19 ____

Permanent Repairs Completed By ____ at ____ A.M. P.M. Date ____ 19 ____

Approved for filing by ____ Date ____ 19 ____
Maintenance Supervisor

Description of Repairs as made:-

APPARATUS repair record



____ DISTRIBUTION DIVISION

SUBSTATION OPERATION REPORT ... Date ____

SUBSTATION TRANS. BANK Time ____ A.M. P.M.

Use this form for reporting all operations, inspections (except those covered by a 'Routine Inspection Report') etc. of any apparatus at any Substation or 13.2 KV. Transformer Bank except the tagging of individual street lighting circuits. The person performing such an operation or inspection must fill out a copy of this form and forward it to the Maintenance Supervisor.

Approved for filing ____ Signed ____
Maintenance Supervisor Inspector

SUBSTATION operation report

ing, testing, tagging or any other work in connection with any apparatus at a substation or 13.2-kv. transformer bank except such matters as are covered by the foregoing "Routine Inspection Report," and except the tagging of individual street lighting circuits. This form is made out in the field by the person performing the operation and turned in as soon as possible to the maintenance supervisor. If the latter's office is closed it is given to the trouble operator, who then sends it to the maintenance supervisor in the regular way. The person making out the report signs it in the space marked, "Operator." When the maintenance supervisor is satisfied as to the accuracy of this report, he signs it in the space marked for him and files it chronologically with the routine inspection reports.

In switching operations this form does not need to be an exact copy of the load dispatcher's order, but is required accurately to describe the operations as performed. All tags are preserved and filed chronologically in a convenient place. A copy of this form is also made out for the use of relay testers. Except in an emergency the maintenance supervisor has to be consulted before any switching operations are started.

Inspection Times

Certain substations are inspected each Wednesday by a wireman selected for the purpose by the superintendent of distribution, or on the next day following if Wednesday is a holiday. This man is required to report in person to the maintenance supervisor before and after making the inspections. All other substations are inspected on the first Wednesday of each month by a maintenance man of the operating department. The principal features of these inspections are covered on the routine inspection reports, but this does not excuse the inspectors from noting and reporting any other undesirable conditions such as accumulated rubbish, weeds, tools or parts left behind by workmen, etc., which can be readily seen. Rubbish or other foreign matter is required to be removed by the inspector at the time, but if this is impracticable, he reports it on the apparatus repair record.

On the first Wednesday of each month the inspector examines all Novalux relays operating from pilot circuits, except those in substations maintained by the production department. The contacts which carry the operating current (110 volts) for the controllers are examined and filed if necessary.

Certain substations on the system are also inspected every Sunday afternoon (late) by an emergency man, who makes a quick visual examination of conditions, tests the 2,300-volt bus for grounds and signs a routine inspection form for each, filling out the arrival and leaving time and conditions found, without attempting to cover the detail of the periodic thorough inspection. These reports are transmitted and filed as are those previously described in connection with the maintenance

ROUTINE INSPECTION - MOVING APPARATUS AT TRANSFORMER INSTALLATIONS

Date ____

Approved for filing: ____ Signed ____
Maintenance Supervisor Inspector

Location	Time	Transformer Thermotel or Thermometer Reading Light	Power	Air Temp. °F	Ventilating Fans Condition As Found No. 1	No. 2	Lubricated No. 1	No. 2	Motor Found Running No. 1	No. 2	Motor Started No. 1	No. 2
	AM PM						Yes No	Yes No	Yes No	Yes No	Yes No	Yes No
	AM PM						Yes No	Yes No	Yes No	Yes No	Yes No	Yes No
	AM PM						Yes No	Yes No	Yes No	Yes No	Yes No	Yes No
	AM PM						Yes No	Yes No	Yes No	Yes No	Yes No	Yes No
	AM PM						Yes No	Yes No	Yes No	Yes No	Yes No	Yes No
	AM PM						Yes No	Yes No	Yes No	Yes No	Yes No	Yes No
	AM PM						Yes No	Yes No	Yes No	Yes No	Yes No	Yes No
	AM PM						Yes No	Yes No	Yes No	Yes No	Yes No	Yes No
	AM PM						Yes No	Yes No	Yes No	Yes No	Yes No	Yes No
	AM PM						Yes No	Yes No	Yes No	Yes No	Yes No	Yes No
	AM PM						Yes No	Yes No	Yes No	Yes No	Yes No	Yes No
	AM PM						Yes No	Yes No	Yes No	Yes No	Yes No	Yes No

Remarks:- (List here any apparatus Repair Records made out).

FORM used in routine inspection of moving apparatus at transformer installations

supervisor's office. The maintenance supervisor keeps an up-to-date list of all materials required to be kept at each substation, one copy being posted at the substation as before indicated and the other kept in the office.

Static Condensers

The first Wednesday of each month is the day for inspection of all capacitor installations. This consists of a general visual inspection except that the houses need not be opened. An ammeter of the Ferranti or tong test type is used to check the current in each feed wire. The position of the oil circuit breaker is reported. If it is found to have opened or if the current in one or more of the feed wires is below normal, it is probable that one or more of the condenser units has failed. At the November inspection the interior of the houses is thoroughly cleaned and any necessary repairs or adjustments made.

Transformer Vaults and Manholes

Every transformer vault or manhole where the installed capacity exceeds 74 kva. is required to be inspected on the first Wednesday in January, April and July yearly by a maintenance man from the operating department, and by the maintenance supervisor personally during the last two weeks of October yearly. Vaults under 75 kva. are inspected on the last Thursday of each March and September by a maintenance man from the operating department. Each manhole with transformers below 75-kva. rating in toto is inspected in the last week in June by such a man.

Additional inspection is given transformer vaults and manholes having moving machinery. Where ventilating fans are installed, an inspection as above takes place every Thursday, but this may be omitted from November to April inclusive in places where it is definitely known that fans are not required in cold weather.

Manholes where fans are installed are visited nearly every working day, during periods when the vault temperature is known to be high, by some man from the operating department, to determine if air is issuing from the outlet. It is not usually necessary to enter the vault for this purpose. At weekly inspections fans and their control apparatus are carefully examined, and if the fan is not already in operation it is started and run long enough to determine that it is operating properly.

Care of Sump Pumps

All vaults or manholes with sump pump installations are inspected every Thursday by a maintenance man, at which time the pump motor and control apparatus are carefully inspected and the pump operated for five seconds by closing the contacts at the float switch. Sump pumps are not allowed to be run longer unless the lower bearing is covered with water. Such pumps in wet locations are lubricated on first Thursdays monthly during the water pumping period; those in normally dry locations are lubricated on the first Thursday of February and September yearly.

The general line foreman is responsible for the inspection of wet manholes.

ROUTINE INSPECTION 13.2 KV. TRANSFORMER BANK CONDENSER INSTALLATION

Date _____ 19 ____

Location _____ Time _____ A.M. P.M.

	TRANSFORMERS		
	No. 1	No. 2	No. 3
Bushings			
Oil Level			
Max. Temperature			
Temp. Device Reset	Yes No.	Yes No.	Yes No.
General Condition of Transformers			

DISCONNECTING SWITCHES			
Cct. No.	Open	Closed	Gen'l. Cond.

GENERAL CONDITIONS (Mark O.K. or X)

Supplies on hand as per list	
Bus Supports	Box for Supplies
Yard	Fence
Gratings	Potheads
Tetrachloride Fuses	

STATIC CONDENSERS

Oil Switch	Open Closed	Setting	Amps.
Amperes	A	B	C

Apparatus Repair Record Made Out Yes No

Remarks:-

Approved for Filing _____ Signed _____

Maintenance Supervisor Inspector

FORM FOR routine inspection of condenser installations

List of Supplies to be Kept at a 6,000-Kva. Substation

1—S & C Fuse Tongs (Wooden)
1—Switch Stick (Outdoor Type) in shelter
1—Metal Waste Can
1—Broom
1—Shovel
1—Rake
Red, Blue, White and Yellow Circuit Tags (12 Each Minimum)
1—Tin Box of Matches
3—Candles in Tin Box
1—Kerosene Lantern
1—Set of Ground Sticks No. 3940
1—Ladder
1—Short Step Ladder
1—High Voltage Lead

SPARE FUSES AS FOLLOWS:

2—200 Amp. 7,500 V. S & C Tetrachloride fuses for Station Service
3—175 Amp. 250 V. Blade Type for Main Switch
2—100 Amp. 250 V. Blade Type for Switch Motors
4—80 Amp. 250 V. Ferrule Type for Regulators
8—60 Amp. 250 V. Ferrule Type
2—50 Amp. 250 V Ferrule Type
6—40 Amp. 250 V. Ferrule Type
4—35 Amp. 250 V. Ferrule Type for lights
6—1.5 Amp. Westinghouse 600 V. Cat. No. 3063 (Thermal Cutouts for Regulator Motor)
5—30 Amp. 125 V. Edison Base Fuses
5—25 Amp. 125 V. Edison Base Fuses
5—20 Amp. 125 V. Edison Base Fuses
5—15 Amp. 125 V. Edison Base Fuses
2—10 Amp. 125 V. Edison Base Fuses
6—6 Amp. 125 V. Edison Base Fuses
10—30 Amp. 250 V. Cartridge Fuses
5—15 Amp. 250 V. Cartridge Fuses
5—10 Amp. 250 V. Cartridge Fuses
2—5 Amp. 250 V. Cartridge Fuses for Voltmeter
3—25 Amp. 7,500 V. S. & C. Fuses for 575 V. 3-ph. Transformers (Cat. No. 16031)
4—5 Amp. 2,300 V. S & C Potential Fuses for 5 kva. Transformers
1—1.3 Amp. 2,300 V. Potential Fuse for Ground Test Switch Stick
10—G.E. Fusible Links for Regulator Motor Thermal Cutouts
3—Type R Neon Bulbs
4—6.25 Amp. 250 V. Cartridge Fusetrons
4—4 Amp. 250 V. Cartridge Fusetrons
6—2 Amp. 250 V. Westinghouse Thermal Refills for Regulator Motors Cat. No. 306345B
6—1.42 Amp. 250 V. Westinghouse Thermal refills for Regulator Motors Cat. No. 306344B
6—18 V. 0.11 Amp. GE., Pilot Lamps for red and green lights
2—200 watt 115 V. lamps for yard
2—50 watt 115 V. lamps for Switch House Lights

Editorials

S. B. WILLIAMS, *Editor*

The New Secretary of Interior

THIS WEEK when J. A. Krug takes over as Secretary of Interior the Department which controls the largest aggregate of power capacity in the country will be headed for the first time by a power man. That he came up by way of public power and admits freely that he is a public power man at heart should cause no dismay among private power interests, because it should be obvious that no one could administer properly the Interior's immense power domain without being favorable to public power.

However, to believe in public power is not necessarily to be a crusader for public power, right or wrong. Nor is it necessary to fight private power at every point. That is the difference between Krug and his predecessor. Krug knows the power systems of this country. He knows from his Office of War Utilities experience that they have demonstrated their ability to serve the country well. Also, by virtue of his regulatory and operating experience he has a profound knowledge of power economics which should temper with practicality any philosophy he might have.

With such a man heading Interior it ought to be possible to establish a sound working relationship between public and private power based on the greatest benefit to the country, instead of trying to settle the problem by recrimination in the daily press. We hope that the new secretary's appointment marks the end of mud slinging on a personal basis.

In the past several years there was little or no effort by Interior and private power to know each other, so great was the gulf between them. When people are on the opposite sides of a fence, there is all the more reason for them to try to understand each other, for they may find that there is a lot they can agree on. In this case the new Secretary, and the private utilities are no strangers to each other; in fact, there developed between them during the war no small amount of mutual confidence and respect.

The new Secretary has won his spurs as an administrator, so much so that he was appointed to this important post without a political following. It should be expected that Interior from now on will administer the law as it is written, and not as somebody thought it ought to have been written. In fact, the testimony of the new Secretary before the Senate Public Lands Committee shows that questions of power will once more be settled on the basis of reason, and not on the basis of ideology.

Labor Makes a Mistake When It Defies the Law

A MOST DISTURBING NOTE in the current labor disputes in the electrical manufacturing industry is the complete defiance of the law by certain union leaders. During the strikes against General Electric in Philadelphia and Westinghouse in New Jersey, union leaders have openly refused to abide by orders of the courts and much violence has resulted. In Philadelphia, the strikers went so far as to pass a formal resolution of intent to defy the law, stating: "We will fight any attempt to break any strike by injunctions, and pledge that each and every one of us will be represented on the picket line tomorrow."

In New Jersey, when the president and four stewards of one of the unions on strike were before the court on a contempt-of-court charge, Vice-Chancellor Stein of the Chancery Court in Newark was called upon to state to the defendants, "This is no laughing matter. Now behave yourselves."

If the constitutional rights of the strikers had been violated by the issuance of injunctions restraining them from doing acts deemed illegal by the court, they had a legal remedy. But failure to obey a court order and fighting the police who attempt to enforce it, and making a laughing matter of a court proceeding, are not the American way of doing things.

No group of people in this country no matter how well organized or how strong politically can set themselves up against the law. Any attempt to correct by force what are felt to be legal discriminations when the orderly processes of the courts are available is a mistake, and is bound to react unfavorably in the opinion of the public regardless who makes the attempt.

How Much Transformer Impedance?

Perhaps there is nothing basically wrong with the amount of impedance that distribution transformers have. But, like many other items that become matters of habit, there is a chance that a percent less in impedance might make enough difference in performance to justify the difference in cost to manufacture. The only way to find out is to study the consequences, good or bad, and weigh them against the costs they entail or the savings they offer.

Admittedly there is not much the transformer designer or fabricator can do to reduce the impedance greatly without running into increased cost. Yet, assume for a moment that a 10 percent economic gain would come from specifying a transformer costing only 5 percent more to produce, there might be reason to make the transition. Whether that marginal gain would be justifiable depends on several tangible factors coupled with the slightly intangible factor of load growth and the possibility of a public demand for more refined voltage regulation.

The tangible items to study would be those in the field of voltage regulation and in the protection against faults.

Less impedance would mean less voltage drop through the transformer, lessened call for voltage regulators, capacitors and less need for using generously large secondaries. Against such a gain would have to be set the somewhat greater fault current and what it would cost in fuses, relays, breakers and damage under fault conditions. The reverse would be true with larger values of transformer impedance than the present values.

Transformer loss ratio has been opened up for discussion in recent years and it would seem worthwhile to settle at the same time the question whether the comparison matter of voltage drop through impedance would not perhaps benefit by change or at least by exploration. Whenever the issue has come up before it has usually arisen in connection with equality of values among manufacturers to facilitate delta-banking or paralleling but that seems far less urgent than to have the impedance at optimum value for the great bulk of distribution transformers used alone.

Public Likes to See What Makes Utilities Tick

TO THE GREAT MASS of the general public little is known about the physical facilities that make up an electric utility. Admittedly they know there are poles and meters but they seldom get a chance to see what is underground, or in the power house, or in the substation.

For many it would make no difference if they did see or know, but there is a very sizable and inquisitive portion of the public that definitely is interested in the technology of industry. They are swarming to exhibits of newly disclosed war-time developments in the larger cities. They are pressing to view exhibits of radar and learn its rudiments along with those of atomic fission. Displays of manufacturing processes and products command attention and undoubtedly win respect for industry and for private initiative.

Coming directly to the electric utilities, it must be admitted that comparatively little effort has been made to let the consuming public see what makes electricity tick in the home. Granted, that high school groups and some adult civic groups have been conducted around plants and others have heard good illustrated talks.

But there have been precious few physical displays set up in an exhibit atmosphere where the whole process and the intricate electrical equipment required can be shown against such a composite chart as that devised for Duquesne Light Co. At the Buhl Planetarium the company has a physical exhibit built around an animated form of the system chart. Interest is running high—just as high as in the parallel radar, sunspot and nuclear energy exhibits.

So, while waiting for appliances to display it might not be a bad idea for any utility that can find an appropriate environment to show what its physical system comprises.

Possibilities of a Power Shortage

ARE THE TABLES going to be turned? All during the early years of the war there were repeated warnings of a coming power shortage which never arrived. Now that the war load is past, and a great many people expected that it would be a few years at least before the voids left by war usage were filled, it may be possible that a power shortage is threatening.

In a growing number of industrial areas new peacetime loads are coming on the line in such volume that the lost war load may be more than overcome before the end of this year. Some places already are ahead of previous demands.

To take care of anticipated load growth a considerable volume of generating capacity was ordered, but as the past months advanced it has become apparent from the orders placed that considerably more will be needed than was anticipated six months ago. Again the manufacturer's capacity is being taxed to the utmost but without the advantages this time of a regulated labor and material supply.

Nor does the strike at the plants of two largest turbine producers make matters any easier. There have been no reports on the number of units scheduled to be on the line this fall to carry the 1946 peak that will be delayed in delivery until next year. It isn't going to be possible, obviously, to take nearly a quarter of a year out of full production without throwing a delivery schedule out of order.

Interconnections and continued reliance on veteran equipment will in all probability take care of this year without great difficulty, but the electricity supply business must look further ahead than just a few months. If the volume of new business is maintained, and perhaps accelerated when residential and commercial appliances are available, then it may be somewhat of a problem to meet the 1947 peak in several places.

Ever since 1941 the country has enjoyed a good rainfall, with the result that water power could be relied on to carry its weight. This cannot be counted on to continue forever, so here is another factor to be appraised in terms of power adequacy over the next couple of years.

To some degree the same difficulties that are preventing utilities from getting a sufficiency of materials for their expansion program are besetting their customers so that there will be a corresponding delay in contracted load coming on the line as well as a reduced demand from those sections of customer plants where raw materials and parts are in insufficient supply.

This, however, will probably have less and less effect beyond this year, because deliveries should improve progressively after this wave of strikes has passed. Likewise service equipment deliveries may hold up some new loads this year, but not to a much lesser degree probably after the middle of next year.

WASHINGTON COMMENT

By R. N. LARKIN, Washington Correspondent

Where Krug Differs from Ickes on Public Power

J. A. KRUG, who took over as Interior Secretary this week, is far from intimate with the vast jurisdiction he inherited from Harold L. Ickes. Although, of course, he knows the power business thoroughly, and has far more than a passing acquaintance with Interior's place and aspirations in it.

On the basis of testimony he gave before the Senate Public Lands Committee in the brief hearing on his own nomination, the differences between Krug and the privately owned portion of the nation's electric power business are basic but not incapable of being bridged.

A Public Power Man

Krug is, as he took pains to point out to the committee, a public power man. Even if he were not such idealistically, he would have to be so actually in his new job, for such laws as the Reclamation Act, the Bonneville and Fort Peck Acts, the Reclamation Project Act and the Flood Control Act of 1944 establish as national policy the development, transmission and preferential sale of power under federal financing. The meticulous respect which Krug paid to law and grants of authority under which WPB operated must be convincing that he will not second-guess the statutes governing his new job.

There are two fundamental points at which Interior and the private power business will continue at loggerheads. But the industry, if it studies them, will realize that differences on these matters—taxes and preferential sales of power—are with Congress primarily, not with Interior. It is Congress which enacted the statutes under which public power gets the right of tax-free operation and the duty to sell federal power preferentially. Krug might very conceivably oppose any attempts to change these, but it must be obvious that he can neither change them himself nor reasonably be blamed for operating under them up to the hilt.

Krug's testimony on power should not be and beyond question will not be his last word on Interior power policy. It was, however, a statement which seems to leave no irreconcilable gap between an Interior secretary who wants to be as reasonable as Krug indicated he wants to be and an industry which should be happy of the chance to deal with a reasonable Interior secretary.

The testimony shows clearly that certain ideas may be expected to prevail under Krug which differ radically from those advanced by his predecessor.

Ickes, for instance, directed Interior power marketers shortly before his resignation to lend "active assistance, from the very beginning of the planning and authorization of a project" to the municipalization of distribution systems within service distance of federal hydroelectric plants. Inescapably, such a policy would bring the resources of the Interior Department to bear on local politics.

Would Let Local Community Decide

Krug, by contrast, told the committee that "the local community should be permitted to decide on its own whether it wanted to take advantage of that source of (federal) power in distributing it to its people."

He added:

"I don't feel that retail distribution should be in the hands of the federal government at all. I think that is the kind of problem that should be handled by local groups, communities, public power districts or cooperatives. I don't feel that all of that should be in the hands of public enterprise. I think the healthy situation is where in each area the agency able to do the job best does it."

Asked whether he would consider it his duty to "proselyte or evangelize in the local field to induce local people to go into the power business on the retail or distribution side," Krug replied:

"No, I don't think it would be . . . I don't think the federal government has any business in the local field telling communities what they should be doing. I find most communities are intelligent enough to find out for themselves what they should do, and I think the less we have of the federal agency telling local communities what to do, the better off the country will be."

It was made plain, in another passage, that Krug personally favors the preferential sale of federal energy, a matter which meets strong utility opposition on the basis that it tends to promote government in business for the sake of being in business.

Favors Preferential Sale

"I am a firm believer," Krug asserted, "in the policy established by Congress that when power is developed at these big federal projects, the public group should get preference, and I would carry out that intent of Congress to the letter and with enthusiasm until it were changed by Congress.

"On the other hand, I think that in every case, adjustments with privately owned facilities can be worked out in such a way that the private investor is not destroyed, so that new power can be brought in as a supplement to the existing source of supply."

There are further contrasts to be found between Krug and Ickes. The latter was a famous accumulator of jurisdiction. Questioned in this regard, Krug said:

"I think there is too much going on in Washington having to do with one department's prerogatives, rather than looking at the whole picture and deciding how the job should be done and where."

Ickes often demonstrated his adherence to the theory that private ownership of power must cease. Krug made it clear that he can abide continued existence of private ownership.

During recent years, there have been complaints that Interior has been sacrificing irrigation for power.

"I think there might be cases," Krug declared, "where the need of water for irrigation is so great that you must sacrifice some of the power advantages in order to take care of irrigation."

NEWS OF THE WEEK

G.E. Strike Ends; Workers Still Out at Westinghouse

Locals Expected to Approve 18½ Cents an Hour Raise Granted Union by General Electric—Utility Equipment to Get Preference When Work Resumes Monday—Westinghouse Claims Higher Wages Now

Equipment for utilities and industrials is expected to get priority on the production lines of General Electric Co. as workers go back to work Monday following settlement of their 57-day strike on Wednesday evening, when G. E. agreed to 18½ cents an hour raise. Approval of the local unions involved, which is necessary to make the agreement official, was expected to be a mere formality.

Still struck Thursday evening were the plants of the Westinghouse Electric Corp. The possibility of a quick settlement faded as officials of Westinghouse and of the union, the United Electrical, Radio & Machine Workers, C.I.O. which was also involved in the G. E. strike, met in New York with Arthur S. Meyer, chairman of the State Mediation Board, and William H. Davis, former chairman of the National War Labor Board, special representatives of Secretary of Labor Lewis B. Schwellenbach.

One of the biggest hurdles to immediate settlement by Westinghouse, according to President Gwilym A. Price, is the fact that his company is now paying more money than G. E. will pay under the new agreement. In a statement issued following the settlement of the G. E. strike, Mr. Price said:

"Based on advertised hourly earnings of $1.09, excluding overtime, for General Electric male workers, the increase would bring average earnings to $1.27½. This means that the Westinghouse average of $1.32 still is 4½ cents higher than the new General Electric rate. We are confident that a comparison of rates for both men and women will reveal the same differential.

"Westinghouse intends to continue its policy of paying wages equal to or better than rates in communities in which its plants are located. However, any final agreements made by Westinghouse with the union must take into account the fact that Westinghouse has been paying wages 11 percent higher than the average for the electrical industry.

"It is unreasonable, in view of the great gap existing between wages of Westinghouse and others in its industry, to expect Westinghouse to settle on the same basis as those who have been paying lower wages."

Assurance was also asked of the union on two other points "which are as important as wages in insuring peaceful and productive operations and employment."

These points were:

"Union assurance against strikes, slowdowns, work stoppages, and refusal to do assigned tasks in violation of contract, and recognition of management's right to discipline employees guilty of such action.

"Elimination of inequalities in our (Westinghouse) incentive system, resulting from the war emergency, and recognition of management's right to establish time values for work so that additional earnings above base rates will be justified by employees' productivity."

General Electric Situation

Settlement of the General Electric strike was brought about by an agreement of the negotiation committee of the company and the U.E.R. & M.W. union at 7:08 p.m., after a 6-hr. session.

Immediately following, President C. E. Wilson stated: "An increase similar to that offered the United Electrical, Radio, & Machine Workers will be offered to employees represented by other bargaining units. Also, in accordance with our past practice, comparable adjustments will be put into effect for employees who are not members of a bargaining unit and who receive less than $5,000 per year. Details will be announced shortly."

Equipment for utilities and industrials is expected to be in production first. Generators, transformers and switching equipment, transmission and distribution equipment which were in the process of fabrication when the plants were shut down on January 15, will begin the completion process on Monday morning. Many of the component parts, particularly on generators and switchgear, which were left in the machines during the strike will be finished first, and production on these items will proceed immediately.

During the strike, engineering and commercial operations on new orders and the expediting of orders then in process were carried on in improvised offices. As a result, orders will proceed faster than would have been possible otherwise.

Non-productive Employees Busy

Since March 11, the non-productive employees have been busy correlating orders, data on component parts available, raw materials received at the plant, and the present status of the equipment now in process. On March 12, 6,000 out of a total of 12,000 non-productive employees reported at the Schenectady works. This percentage is thought to be indicative of that at other plants at that time.

Late this week there was no definite picture of the number of employees who would report on Monday, nor on the inventory situation.

Construction Control Effect Still Uncertain

CPA Order Restricting Building Except for Housing not Yet Issued—Utility Work Stoppage Unlikely

There was disagreement in Washington this week as to how soon the Civilian Production Administration will issue an order reinstating vigorous controls on construction other than housing, but advocates of the "everything-for-housing" school appeared not to have lost any ground.

Housing Expediter Wilson Wyatt was quoted early this week as saying the order which is expected to be a return to the standards of L-41, the wartime order controlling construction—would be out "in a matter of days." Around CPA, the impression was unmistakable that it would be a minimum of two to three weeks before the order is issued.

As the tug-of-war goes on between the housing people and other agencies which are interested in construction programs other than housing, the Wyatt group is reported to be adamant in its position that virtually all non-housing construction be halted and required to demonstrate its essentiality before being allowed to proceed.

CPA Lacks Enforcement Staff

In support of the belief that the order will not be out for some weeks are the facts that CPA has now neither the money nor the authorization for a field staff, estimated at 800 to 900, for enforcement of the order, and that so many objections have been filed in connection with the proposed order that it will take some time before decisions on them can be reached.

Prospects for exemption of power plant construction from terms of the impending order remained obscure, with efforts to obtain this exemption still being pressed. Support of the Agriculture and the Interior Departments for such exemption was obtained. In addition, a study was made which indicated that the competition for materials which the power plant construction program would offer the housing program is infinitesimal, both in materials and dollarwise.

The opinion was further expressed that should the order issue with a prohibition against further plant construction and a requirement that essentiality of such projects be demonstrated before construction be resumed about 95 percent of the plants under construction would be cleared for completion automatically under the criteria of essentiality now proposed.

A proposed exemption of $15,000 for industrial construction, it was felt, would allow the construction of many minor utility installations without the necessity of demonstrating essentiality.

It was learned that the original version of the proposed order contained a prohibition against the construction of transmission lines and power dams, but it is regarded as certain that this will be removed.

Meanwhile, a group of industry people is working with CPA officials to determine what materials necessary to bring service to new housing are most apt to be scarce. Thus far, little has been accomplished in view of the indefiniteness of the supply picture because of strikes. It was pointed out that little can be done by the committee until the supply situation is clarified and until Congress enacts the legislation on which the Wyatt program will be based. If the act specifies a $6,000 ceiling on homes, it was noted, materials requirements for electric service will be distinctly different from what they will be if the ceiling is somewhat higher. This is due to the fact that $6,000 homes can only be built on relatively cheap land which is apt to be farther away from existing facilities than more expensive land.

FAREWELL GIFT—Rex I. Brown, left, president of Mississippi Power & Light Co., presents Henry B. Sargent, former vice-president, a silver service before he leaves for Phoenix where he will be associated with Central Arizona Light Co.

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25,000-Kw Unit Planned

Florida Power Corp. will start construction shortly of a 25,000-kw. unit at its Benson Springs plant. The capacity of the station is now only 12,500 kw.

California Board Refuses to Waive Bidding Order

Blocking the attempt of California Pacific Utilities Co. to acquire through a private sale agreement the properties of Eastern Oregon Light & Power Co., the California Railroad Commission has refused California Pacific's request that the recent commission ruling on competitive bidding be waived in this particular instance. (ELECTRICAL WORLD, February 9, page 8).

California Pacific, in its financing plans for the proposed purchase, had entered into a tentative agreement with The First California Co. to sell $1,375,000 of 3⅛ percent first mortgage bonds at not less than par and 29,986 shares of common at not less than $29. The commission indicated that in denying exemption of California Pacific from its new bid rule requiring utility companies to submit security incomes in excess of $1,000,000, it was not convinced that the company would receive the best price under the proposed private sale arrangement. However, at the hearing February 27, Halsey, Stuart & Co. offered to buy the bonds on a 3 percent basis and the stock at not less than $30 a share, on the competitive bid basis required by the commission.

In Oregon, the purchase of Eastern Oregon Light & Power by California Pacific is still being strongly opposed by Union County People's Utility District. The P.U.D. earlier had offered to buy Eastern Oregon properties at a price approximately that agreed upon between California Pacific and Eastern Oregon, and complains that it had not been notified that an agreement between the two principals had been negotiated. Original cost of Eastern Oregon properties as of November 1, 1945, was reported at $2,227,395.

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Puget Sound Lines Shorn by Substation Explosion

A heavy explosion in a Puget Sound Power & Light Co. substation in Seattle, March 1, resulted in damage that destroyed almost the entire structure.

Evacuation of families in the block was necessary when the explosion of two 6-kv. transformer banks left live wires dangling near the residences. Until the power load could be shifted, hundreds of homes and two hospitals were without light.

Fire department spokesmen described the power failure as one of the city's worst in several years. Company officials said a preliminary investigation indicated that failure of insulators had probably caused the explosion.

NEMA Drives for Laws to End Union Restrictions

Asks Members to Carry Appeal to Congress for Legislation Which Will End Boycott of I.B.E.W. against Equipment Made by Non-I.B.E.W. Members Including C.I.O.—Restrictions and Hardships Explained

A drive to secure federal legislation which will prevent the International Brotherhood of Electrical Workers from boycotting, restraining, or destroying interstate trade and commerce has been launched by the National Electrical Manufacturers Association through its 470 members.

In a letter signed by W. J. Donald, managing director, members are asked to bring to the attention of their Congressmen and Senators a lengthy statement approved by the NEMA Board of Governors telling of the nationwide effect of I.B.E.W.'s boycott of electrical products not made by members of that union and sometimes even of such products when made by members of that union who are members of a local in another area.

Boycott Is Entirely Legal

That this action is entirely legal is pointed out in the statement. A Supreme Court decision last year in its decision in the case of Allen-Bradley Co., et al. v. Local No. 3, I.B.E.W., et al., the New York City local, recognized that these union activities substantially restrain trade but that under the Clayton Act, in light of the Norris-LaGuardia Act, labor, acting alone, is exempted entirely from the anti-trust laws. The Supreme Court placed the responsibility for the situation on Congress. Legislation is needed to correct the situation.

As a result of the lack of such legislation, the statement points out that these conditions have developed:

1. The I.B.E.W. by the threat of boycott is attempting to compel manufacturers to recognize the I.B.E.W. where other unions have already been designated as collective bargaining agents. Local I.B.E.W. unions have approached manufacturers, threatening the use of this boycott and suggesting that they "steer" their employees to membership in the I.B.E.W. Thus an electrical manufacturer is threatened with exclusion from interstate commerce unless he violates the provisions of the National Labor Relations Act.

2. Boycotts are delaying and increasing the cost in housing for veterans and others at a time when the policy of the Government is to exert every effort to expedite a low-cost housing program.

3. As a result of these boycott conditions, federal, state, and municipal authorities are compelled to violate the spirit of and the public policy behind laws providing that contracts be let to the lowest responsible bidder.

4. Trade barriers are being set up around each municipality against importation of electrical goods. Each manufacturer seeking to sell to a national market must scatter his production over the entire country and thereby the consumer loses the economies of mass production.

Since the Supreme Court decision was made, many locals at the request of the international president of the union have refused to handle lighting fixtures not made by I.B.E.W. members, and in Massachusetts and Rhode Island this boycott has been extended to wire, cable, fixtures, or electrical conduit.

How manufacturers are so powerless that they are being given the choice of violating the law or going out of business is related, and Neon Products, Inc., a sign manufacturer of Lima, Ohio, is given as an example.

The National Labor Relations Board has certified a C.I.O. union as the bargaining agent for the employees of this firm. All the terms of the agreement with the C.I.O. are entirely satisfactory and legal. Yet when a sign is sold in a city where the electrical contractors are signed up with the I.B.E.W., and this includes most larger cities, the sign won't be hung. Both NLRB and the Department of Justice have advised the company that it can obtain no relief under the existing law.

Another example is the International Lighting Exposition being held next month in Chicago. The exhibitors (most of whom are organized by the C.I.O.) have been advised by the exposition manager that "as the electricians are A.F.L. (I.B.E.W.), all lighting fixtures to be hung in the hotel must bear the I.B.E.W. label."

Further examples are given of the costliness of the boycott. In the New York metropolitan area, the Federal, state and municipal governments include a clause in all building construction contracts which provides that: "The contractor must employ such methods and means in the carrying out of this work as will not cause an interruption or interference with any other contractor."

The clause enables the governments to award contracts to non-lowest bidders who, however, are satisfactory under the union boycott rules.

In certain cases in New York where the equipment could not be secured bearing the proper union label, the equipment would be purchased disassembled and then assembled locally by local union men, a costly procedure which was not so satisfactory.

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Utility Retains Franchise

The franchise of the Duke Power Co. at Hickory, N. C., has been renewed for a 30-year period. The utility must pay the city three-fourths of 1 percent of its gross annual receipts from its business in Hickory and taxation on its properties at the standard rate.

PALESTINE ELECTRIC LAMP PLANT—One of the new industries established in the Jewish Homeland is the manufacture of light bulbs in this modern plant

BPA Power Sales Drop; Revenue Rises

Practice of Selling Power Capacity Rather Than Energy Proves Profitable—Extra Power Now Available

The Bonneville Power Administration's practice of selling power capacity rather than energy stood the agency in good stead during the fiscal year ended last June 30, for revenues increased almost 10 percent during the year despite a small decline in kilowatt-hours sold.

Sales totaled 8,502,000,000 kw.-hr. during the fiscal year, a decrease of 169,000,000 kw.-hr. from the total of fiscal 1944, but revenues rose from $20,896,000 to $22,990,000. BPA's annual report noted that "the situation arises from the fact that the revenues are power billings which are based upon capacity contracted for rather than upon energy delivered as regards the bulk of the Administration's service."

BPA indicated that "a maximum of 600,000 kw., or approximately 50 percent of our total capacity, may become available for remarketing" as a result of the cancellation of war loads, and its annual report showed an intensive campaign aimed at peddling the cancelled capacity to be under way.

Study Railroad Electrification

Among the marketing possibilities under study is railroad electrification.

The annual report noted that BPA research indicated that numerous specified products can be produced in the Northwest and added:

"All of these products have been discussed with industrial representatives, and it is expected that a number of new Northwest plants will be constructed in the near future as a result of these contacts."

Contracts were entered into with five educational institutions for research and investigation of several uses of electric energy. The institutions include Oregon, Washington, and Montana State Colleges, the University of Washington and Linfield College. Some of the subjects investigated include electric radiant panel and reversed-cycle heating; electric heat storage; use of electric welders on the farm and their effects on rural lines; possible improvements or changes in a design of distribution systems resulting in a lower cost of distribution; and economics of the heat-pump method for domestic heating.

BPA's 8,500,000,000 kw.-hr. during the fiscal year went to 80 customers. Publicly owned utilities took 824,000,000 kw.-hr., and privately owned utilities another 2,057,000,000 kw.-hr. Industries and military establishments took the remainder. Deliveries to public systems were up 13 percent over those during the 1944 fiscal year, and those to private systems rose 40 percent. Non-coincidental peak demand of 42 publicly owned utility purchasers of Bonneville energy was 73,219 kw. Non-coincidental peak demand of five privately owned systems was 487,675 kw. Total of non-coincidental peak demands was 1,433,180 kw. A record in generation for the Bonneville-Grand Coulee system was established on January 4, 1945, when a one-hour peak of 1,427,000 kw. was attained. Of this, 623,000 kw. were delivered to members of the Northwest Power Pool.

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Controversial Moss Bill Loses in Kentucky House

The Moss Bill which would have amended Kentucky's 1942 TVA Enabling Act has been defeated in the House by a 60 to 31 vote. The defeat followed strong opposition from TVA officials, public power groups, and municipalities who claimed that the bill gave private power companies a perpetual monopoly in the state.

The bill would have prevented a city from building a duplicate plant in the event negotiations to buy a private utility failed and set up a formula of appraisal which opponents claimed was outrageously high in favor of private utilities.

Following passage by the Senate by a 24 to 14 vote and by a House committee by a 5 to 4 vote, charges of bribery were made by a representative who claimed that he had been offered $5,000 to use his influence to aid in its passage. The "mysterious" briber who was supposed to be acting for the Kentucky Utilities Co., charged by opponents as being behind the bill, is still unidentified despite a Senate investigation.

Proponents of the bill countercharged that the supposed briber never existed and that the bribery charge was brought up merely to bring about the defeat of the bill.

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Farm Course Scheduled

A three-day short course on farm electrification and barn hay drying will be conducted March 26-28 at the College of Agriculture, University of Wisconsin, Madison. Farm electrification engineers of several Wisconsin utilities will cooperate with faculty members of the university in presenting 26 lectures on a wide range of subjects dealing with the application of electricity to farm tasks.

Street Light Systems Feel Effects of Strike

The effect of the strike at leading electrical manufacturing firms was felt this week by street lighting systems throughout the country. Most serious was the condition in San Francisco where the street lights were dimmed or else blacked out entirely. Reports from cities employing luminous arcs indicated difficulties in maintaining lights because of a shortage of electrodes.

In the Pacific Coast metropolis, which requires 5,600 bulbs a month for replacements and has less than a week's supply on hand, the following program was adopted:

Current on all street lamps will be reduced to produce 10 percent less light. This will lengthen the lives of the bulbs.

Except at intersections, street lights which burn out will not be replaced.

Circuits formerly used until midnight will not be used at all.

Lights will be extinguished an hour earlier in the morning.

Not more than 20 cities are left that have luminous arc installations and in many the supply of electrodes has been allowed to get low because plans are being made to modernize the systems.

Manufacturers state that as soon as the men return to work, their stocks can quickly be replenished because the total amount needed would require the labor of but a few men.

In the meantime, Syracuse, N. Y., which has the largest luminous arc system, between 14,000 and 15,000 units, avoided a complete blackout when the union allowed the entire available supply of magnetite electrodes, 1,600, in the strikebound Lynn, Mass., plant of the General Electric Co. to be shipped to Syracuse.

This will be enough to operate the system at half strength for a month. Under brownout regulations less than half of the city's lights have been used.

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Canadian Output Statistics

The Dominion Bureau of Statistics has released the following output statistics of Canadian central electric stations in thousands of kilowatt hours:

Period	1945	1944
Twelve months	40,100,608	40,465,733
Primary	33,323,866	36,549,464
Secondary	6,776,742	3,916,269
Exports to U.S.	2,631,245	2,571,872
December	3,288,710	3,356,102
Primary	2,744,538	2,874,666
Secondary	544,172	481,436
Exports to U.S.	217,737	200,684
November	3,018,399	3,252,394
Primary	2,545,482	2,904,454
Secondary	472,917	347,940
Exports to U.S.	218,587	187,257

House Votes $250,000,000 to REA for Co-op Loans

Non-Discrimination against Contractors Building Private Utility Lines Stipulated—Passage of Bill by Senate Considered Certain—Speaker Rayburn Attacks Lobbying by Electric Utilities Against Funds for SPA

The House approved without change this week a $250,000,000 loan authorization for the Rural Electrification Administration and a stipulation providing that REA may not discriminate in the letting of construction contracts against contractors who happen simultaneously to be erecting lines for private utilities in the same area.

Consideration of the REA loan and restriction was without debate except for a short statement by House Speaker Samuel Rayburn, Texas Democrat, who threw down the gauntlet to private power in a bristling speech which asserted that:

"This town, Washington, for the past six months has been seething with utility lobbyists.

Rayburn Ready to Fight

"If they are spoiling for another fight with me," Rayburn added to considerable applause, "as far as I am concerned, they can get it because I am just one man who is not afraid of them as I have already had my fight with them."

Rayburn's speech, a rarity because of his position as speaker, dealt mainly with attempts by southwestern utility executives to defeat "a little appropriation to carry on the business of the Southwestern Power Administration." The agency has asked a $23,000,000 appropriation for the forthcoming fiscal year for initial construction of what is planned ultimately to be a five-state transmission grid with its own 770,000 kw. of fuel-electric generating capacity. Estimated total cost of the project which will market energy from about 30 Army Engineer dams is $200,000,000.

"I warn this House and everybody else who is interested in rural electrification," Rayburn asserted, "against any kind of demonstration that may come from those against so-called public power. I remember when the so-called Wheeler-Rayburn Holding Company Act was being considered by the House in 1935 that this town was seething with utility lobbyists saying that if that bill passed, everybody in the United States who owned stock in a utility would be ruined.

"Today, every decent operating utility company in the United States is glad that bill was passed, that they can own their own utilities, and that they will not be controlled by a holding company in New York City."

Asserting that Washington again is "seething with utility lobbyists," Rayburn added:

"They are now before a subcommittee of the Committee on Appropriations where we have asked for a little appropriation to carry on the business of the Southwestern Power Administration. They are in there to kill it off. Oh, they are great friends of rural electrification now, but they fought it when the bill was under consideration. Why I never know, because in 90 cases out of 100, there was no place on earth for the rural electrification set-ups to buy their power except from the power companies."

"I simply want to warn you who are in favor of the Rural Electrification program and the use of the power that is generated at these dams, that properly used and sold to rural electrification districts and public bodies, and amortized over the years to come, the expense of those great dams will be paid."

Public Power Advocates Alarmed

Rayburn's statement indicated the seriousness with which the public power proponents regard efforts of private power to halt publicly owned transmission and distribution of power. His appearance on the floor culminated a series of attacks on private power which have been made since the activities of the National Association of Electric Companies and other industry representatives before House and Senate committees began in earnest some months ago.

Approval of the $250,000,000 loan authorization for REA assured that this much will be made available for the agency in the fiscal year starting next July 1, for the Senate traditionally restores cuts if they are made by the House in public power appropriations. REA's other iron in the Congressional fire was also in good shape after a House-Senate conference committee on the urgent deficiency bill reached agreement on disputed items and sent the report to the House for action.

The $100,000,000 loan authorization in the bill for REA was not in dispute, but disagreement over other items had threatened to hold up the funds, designed to tide the Rural Electrification Administration over until July 1, when the next fiscal year begins.

These actions by Congress assured that REA will have $550,000,000 for loan authorizations during the fiscal years starting July 1, 1945, and ending June 30, 1947.

Meanwhile, the Interior Appropriation Bill, which was to have been reported this week, has been held up "for at least two weeks," an Appropriations Committee aide disclosed, adding that no tentative date for reporting it to the House is now available. Signal for the real public-private power fight will be the committee's report on the measure, which contains the disputed $23,000,000 SPA item.

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Jersey Senate Approves Bill Anent Utility Strikes

State seizure and operation of public utilities when interruption of service is threatened by strikes has been approved by the New Jersey Senate and now goes to the Assembly for action.

The bill, amended several times since introduced late in January, went through the upper legislative branch after collapse of an effort by labor interests to obtain further delay.

Senate President Proctor, the sponsor, said he believed the revised measure fully protected the rights of labor and declared it should be remembered that the public is entitled to protection as well as management and employees in the industry.

The bill provides for notice by either party when a change of working contract is desired. In the event of a dispute which the State Mediation Board could not settle, an arbitration panel would be named. It would consist of three members, one to be named by management, another by the employees, and the third by these two. If disagreement developed, the Mediation Board would make the selections.

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P.U.D. Wins Tax Suit

Collection of a personal property tax claim against Lewis County P.U.D. No. 1 in Washington was ruled out by the State Supreme Court recently, in reversal of a former Pierce County Superior Court decision.

Holding that the tax lien was not on record on the date the property was acquired by the district, the Supreme Court held that the tax could not be collected. The sum involved was $399.95, levied on property owned in Lewis and Pierce counties by the P.U.D.

Utility and Arizona Authority Negotiating

The Arizona Power Authority, center of a bitter fight that has raged in Arizona politics for the past 10 years, finally has won over at least one utility, Central Arizona Light & Power Co., which serves nearly 50 percent of the state's population.

Evidence of this was the announcement, February 22, that the Power Authority and utility are carrying on negotiations for use of the company's steam plant at Phoenix and transmission lines serving other communities in Central Arizona. The announcement was confirmed by a spokesman of the power company, who added:

"Apparently if it is possible to get any more power from the Colorado River, the Power Authority can obtain it. They must assure the Bureau of Reclamation that they have customers to use additional power before it is allotted. They have a major outlet for this power, and that is us. If they can get it, we want it; and, in the event there are savings, we will pass them on to the consumers."

The change in attitude followed the recent sale of the common stock of Central Arizona Light & Power Co. by American Power & Light Co., and the purchase of about 125,000 shares of the 840,000 shares by local businessmen, who were given a voice in the utility's affairs through the organization of an advisory committee.

L. K. Doutrick, executive vice-president of the utility, accompanied J. R. A. Hobson, Jr., director of the Power Authority, to Boulder City last week for negotiations with E. A. Moritz, regional Reclamation Bureau director, at which the authority applied for 30,000 kw. of the 17.625 percent of Boulder Dam power allotted to the State of Arizona by the Boulder Canyon Project Act. Mr. Hobson said the authority advised Mr. Moritz it hopes to increase that figure to 90,000 kw. as soon as possible.

As a result of the negotiations between the authority and Central Arizona Light & Power, a condemnation suit filed against the company's steam plant and certain rural transmission lines by the authority last summer is expected to be dropped.

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Co-op Franchise Protested

Officials of Portland General Electric Company have protested the recent action of the West Salem, Ore., city council, which awarded Salem Electric Cooperative a five-year franchise to operate, at the same time tabling the Portland company's like request. Company spokesmen indicated they would call for an election in an attempt to obtain franchise rights.

In 1939 Portland General Electric was refused its franchise renewal, resulting in several elections on the power question in West Salem since that time. West Salem is the only municipality in the company's territory where the firm holds no franchise rights.

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Appalachian Electric Adds Small Distribution System

Sale of 34.5 miles of electric distribution lines of the Holston River Co. to the Appalachian Electric Power Co. has been approved by the Virginia Corporation Commission.

The original cost price of the property, which serves the Holston and Glade Spring districts in Washington County and the St. Claire district in Smyth County, was set in the commission's order at $34,621.37.

Appalachian proposes to link the lines with its own system.

No Meters So Customers Will Pay Averaged Bills

Two utilities in the Southeast have acted to provide service for customers for whom they cannot supply meters. Both will use "a flat estimated charge based on the average consumption of the appliances to be used."

Alabama Power Co. has been authorized by the Alabama Public Service Commission to charge its regular rates and to estimate its monthly bills according to this formula:

Lights and small appliances alone, 32 kw.-hr. In combination with lights and small appliances, these monthly averages would be used: refrigerator, 70 kw.-hr.; range, 170 kw.-hr.; storage water heater, 340 kw.-hr.; refrigerator and range, 200 kw.-hr.; refrigerator and water heater, 370 kw.-hr.; range and water heater, 470 kw.-hr.; and range, refrigerator, and water heater, 500 kw.-hr.

Georgia Power Co. has announced a similar plan which is to become effective immediately. The scale of rates will be determined in a similar manner.

MEETINGS

Pennsylvania Electric Association—Industrial committee conference, Hotel Hershey, Hershey, Pa., April 11-12. G. E. Duerr, chairman, West Penn Power Co., Pittsburgh, Pa.

Previously Listed

Pennsylvania Electric Association—Electrical equipment committee, Roosevelt Hotel, Pittsburgh, Pa., March 21-22; B. E. Hagy, chairman, Philadelphia Electric Co., 900 Sansom St., Philadelphia 5, Pa. Prime movers committee, Roosevelt Hotel, Pittsburgh, Pa., March 21-22; N. J. Walker, chairman, Philadelphia Electric Co., 900 Sansom St., Philadelphia 5, Pa. Engineering Section, all committees, Penn Harris Hotel, Harrisburg, Pa., May 28-29; E. B. Shew, chairman, Philadelphia Electric Co., 900 Sansom St., Philadelphia 5, Pa.

American Society of Mechanical Engineers—Spring meeting, Hotel Patten and Reid House, Chattanooga, Tenn., April 1-3; semi-annual meeting, Book Cadillac and Statler hotels, Detroit, Mich., June 17-20. Ernest Hartford, executive assistant secretary, 29 W. 39th St., New York 18, N. Y.

Edison Electric Institute—General sales conference, Edgewater Beach Hotel, Chicago, Ill., April 2-4; annual convention, Waldorf Astoria Hotel, New York, N. Y., June 3-5. Col. H. S. Bennion, managing director, 420 Lexington Ave., New York 17, N. Y.

Midwest Power Conference—Annual meeting, Palmer House, Chicago, Ill., April 3-5. S. E. Winston, director Illinois Institute of Technology, Chicago 16, Ill.

National Electrical Manufacturers Association—Spring meeting, Palmer House, Chicago, Ill., week of April 8; special sections meetings, The Homestead, Hot Springs, Va., June 17-19. W. J. Donald, managing director, 155 E. 44th St., New York 17, N. Y.

Missouri Valley Electric Association—Engineering conference, Hotel Continental, Kansas City, Mo., April 10-12. I. D. Pettegrew, director, 1004 Baltimore St., Kansas City 6, Mo.

Electrochemical Society—Spring meeting, Tutwiler Hotel, Birmingham Ala., April 10-13. Colin G. Fink, secretary, Columbia University, 3000 Broadway, New York 27, N. Y.

National Electrical Wholesalers Association—Annual convention, Stevens Hotel, Chicago, Ill., April 21-25. C. G. Pyle, managing director, 500 Fifth Ave., New York, N. Y.

Society of the Plastic Industry—National plastics exposition, Grand Central Palace, New York N. Y., April 22-27. John Wetherby, secretary, 295 Madison Ave., New York 17, N. Y.

American Institute of Electrical Engineers—Northeastern district, Buffalo, N. Y., April 24-25. H. H. Henline, secretary, 33 W. 39th St., New York 18, N. Y.

Southeastern Electric Exchange—Annual conference, Edgewater Gulf Hotel, Edgewater Park, Miss., April 24-26. J. W. Talley, executive secretary, 303 Haas-Howell Bldg., Atlanta 1, Ga.

International Lighting Exposition—Stevens Hotel, Chicago, Ill., April 25-30. A. B. Coffman, manager, 111 W. Jackson Blvd., Chicago 54, Ill.

National Association of Corrosion Engineers—Annual convention, President Hotel, Kansas City, Mo., May 7-9. Elton Sterrett, executive secretary, 318 Southern Standard Bldg., Houston 2, Texas.

Great Lakes Power Club—Spring meeting, Palmer House, Chicago, Ill., May 24. Almer Skretting, secretary-treasurer, Wisconsin Electric Power Co., Milwaukee 1, Wis.

National Fire Protection Association—Annual meeting, Hotel Statler, Boston, Mass., week of June 3. R. S. Moulton, technical secretary, 60 Batterymarch St., Boston 10, Mass.

American Society of Agricultural Engineers—Annual meeting, New Jefferson Hotel, St. Louis, Mo., June 24-26. Raymond Olney, secretary, St. Joseph, Mich.

American Society for Testing Materials—Annual meeting, Buffalo, N. Y., June 24-28. R. E. Hess, assistant secretary, 260 S. Broad St., Philadelphia 2, Pa.

Canadian Electrical Association—Annual meeting, Banff Springs Hotel, Banff, Alberta, Canada, June 26-28. B. C. Fairchild, managing director, 704 Tramways Bldg., Montreal 1, Que., Canada.

Surplus Property Sales

Surplus property sales up to January 15, as announced by the Reconstruction Finance Corporation, included:

Generators, dynamos—total cost, $1,465,000; total sales, $56,000; on hand, $1,287,000, cost price.

Generator-set units—cost, $35,221,000; sales, $3,147,000; on hand, $28,554,000.

Motors—Cost, $5,444,000; sales, $708,000; on hand, $4,183,000.

Electrical rotating equipment parts—cost, $2,134,000; sales, $5,000; on hand, $2,113,000.

Switchgear—cost, $2,270,000; sales, $139,000; on hand, $1,962,000.

Transformers—cost, $4,934,000; sales, $678,000; on hand, $3,759,000.

Transmission and substation equipment—cost, $2,752,000; sales, $169,000; on hand, $2,453,000.

Power conversion equipment—cost, $9,765,000; sales, $81,000; on hand, $9,631,000.

Junction and outlet boxes, and box covers—cost, $1,605,000; sales, $70,000; on hand, $1,346,000.

Switches and fuse cutouts—cost, $2,163,000; sales, $60,000; on hand, $2,000,000.

Miscellaneous wiring devices—cost, $3,434,000; sales, $86,000; on hand, $3,246,000.

Motor starters and controllers—cost, $1,461,000; sales, $60,000; on hand, $1,294,000.

Other electrical machinery and equipment—cost, $5,160,000; sales, $314,000; on hand, $4,039,000.

Insulated wire and cable, electrical—cost, $2,499,000; sales, $500; on hand, $2,498,000.

Weatherproof copper wire—cost, $1,793,000; sales, $294,000; on hand, $1,221,000.

Rubber-insulated copper wire—cost, $10,106,000; sales, $688,000; on hand, $8,640,000.

Asbestos covered copper wire and cable—cost, $1,139,000; sales, $11,000; on hand, $1,082,000.

Synthetic-insulated copper wire and cable—cost, $1,112,000; sales, $82,000; on hand, $918,000.

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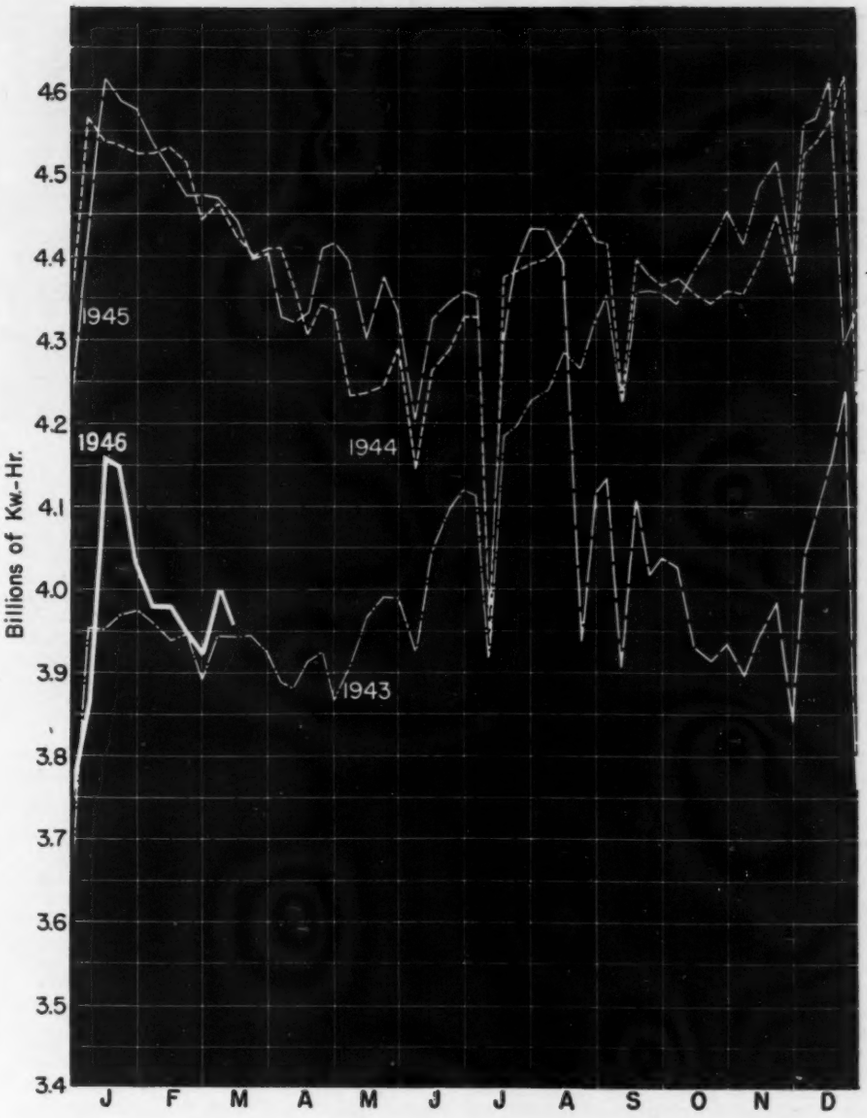
Municipal Workers Strike

Nine employees of the municipally owned Madison (Me.) electrical utility returned to work after a two-day strike over wages. In their absence, they were discharged, and the utility offered their jobs to veterans with electrical experience. Later the employees, who have no union affiliation, were reinstated when they agreed to arbitrate their demand for a 15 cents an hour raise.



Electric Output Curve Moves Downward

The electric output curve moved downward during the week ended March 9, 1946, according to figures released by the Edison Electric Institute. The amount of electrical energy distributed by the light and power industry totaled 3,952,539,000 kw.-hr., compared with 4,000,119,000 kw.-hr. during the preceding week. During the week ended March 10, 1945, the amount of electrical energy distributed amounted to 4,446,136,000 kw.-hr., this year's figure representing a decrease of 11.1 percent.

In all of the seven major geographical regions of the country, output was below that of the corresponding week in 1945. The Rocky Mountain group, which for several weeks, had been the one exception, moved into the minus column, reporting a drop of 1.6 percent. For the week ended March 2 it showed an increase of 1.1 percent, as compared with the corresponding week of 1945. The largest decline was reported by the Central Industrial group, which showed a decrease of 15.7 percent. The Pacific Coast states dropped 13.4 percent.

Weekly Output, Millions Kw.-Hr.

1946		1945		1944	
Mar. 9	3,953	Mar. 10	4,446	Mar. 11	4,426
Mar. 2	4,000	Mar. 3	4,472	Mar. 4	4,465
Feb. 23	3,923	Feb. 24	4,474	Feb. 26	4,445
Feb. 16	3,949	Feb. 17	4,472	Feb. 19	4,512
Feb. 9	3,983	Feb. 10	4,505	Feb. 12	4,533
Feb. 2	3,983	Feb. 3	4,539	Feb. 5	4,524
Jan. 26	4,034	Jan. 27	4,577	Jan. 29	4,524
Jan. 19	4,145	Jan. 20	4,588	Jan. 22	4,532
Jan. 12	4,163	Jan. 13	4,614	Jan. 15	4,539
Jan. 5	3,865	Jan. 6	4,427	Jan. 8	4,568
1945		1944		1943	
Dec. 29	3,759	Dec. 30	4,226	Jan. 1	4,337†
Dec. 22	4,239	Dec. 23	4,617	Dec. 25	4,295

†1944

Percent Change from Previous Year

	Week Ending		
	March 9	March 2	Feb. 23
New England	— 5.1	— 1.9	— 6.4
Mid Atlantic	— 5.7	— 4.3	— 5.2
Central Industrial	— 15.7	— 15.9	— 20.5
West Central	— 2.4	— 1.9	— 3.4
Southern States	— 11.9	— 11.8	— 13.2
Rocky Mountain	— 1.6	+ 1.1	+ 2.0
Pacific Coast	— 13.4	— 13.1	— 10.0
Total United States	— 11.1	— 10.6	— 12.3

SEC DECISIONS—HEARINGS

The Securities and Exchange Commission recently issued a series of orders affecting electric utility companies.

General Gas & Electric Corp. received commission approval for post-effective amendments to its plan for divestment of assets and simplification of its corporate structure. The amendments set forth the accounting entries to be made on the books of the company, as well as the terms, rights and privileges of its new common stock. (Release No. 6444).

Central Vermont Public Service Corp. has received an extension to next June 29 to dispose of the telephone business of Vermont Utilities, Inc., recently merged into Central Vermont. (Release No. 6428).

Oklahoma Gas & Electric Co. has obtained commission approval for exemption from competitive bidding with respect to the proposed issuance of 675,000 shares of 4 percent cumulative preferred stock for purposes of an exchange. In issuing its ruling, the SEC disclosed that it had adopted a new and more stringent policy with regard to requests for exemption from competitive bidding requirements with the announcement that it is "now of the view that, as a matter of future policy, preferred stock issues under the Holding Company Act should ordinarily be submitted to competitive bidding whether or not they involve exchange offers." The commission said that it had changed its point of view since approving without competitive bidding the preferred stock financing and exchange in the case of the Cincinnati Gas & Electric Co. "However," it said, "the present issue was the subject of informal discussion with the staff of the commission prior to the formulation of the above policy. The proposals have been approved by the Oklahoma State Commission as to the accounting entries, and the issuance of the securities has been submitted to and approved by the Arkansas State Commission. Under all the circumstances of this case, and without considering this matter as any precedent in future cases, we will grant the exemption from the requirements of Rule U-50." The commission refused to approve at this time Oklahoma's request for an order nullifying an undertaking entered into by the company and approved by the Commission in 1943, regarding a restriction on the payment of dividends on capital stock of the company. (Release No. 6449).

Crescent Public Service Co.'s proposal to sell at competitive bidding 43,750 shares of new common stock of Colorado Central Power Co. has been approved in a memorandum findings and order. (Release No. 6437).

North American Co.'s declaration of a dividend on its common stock, payable in Pacific Gas & Electric Co. common, has been cleared. The dividend is at the rate of one share of Pacific Gas for each 100 shares of North American, and is payable April 1 to stockholders of record March 4. (Release No. 6424).

Pennsylvania Edison Co. has been authorized, subject to specified conditions, to pay a regular quarterly dividend for the period ending on March 31 of $1.25 on 123,466 shares of $5 cumulative preferred stock and 70 cents on 84,029 shares of $2.80 cumulative preferred. In approving the proposal, the commission ordered the company to send with each dividend check a statement that the SEC has not determined whether or not such payments constitute, in whole or in part, liquidating dividends or are made out of earned surplus available for dividends, and also that the SEC does not purport to determine whether such dividend payments are or are not taxable to the recipient. (Release No. 6448).

Portland Electric Power Co. and Portland General Electric Co. have been permitted to withdraw their joint proposal to sell their capital stock interest in Seattle Gas Co., their subsidiary, together with the capital stock interest in Seattle Gas held by Cazadero Real Estate Co., whose entire capital stock is owned by Portland Electric. Permission to withdraw is to be without prejudice to the right of the two holding companies to file a further declaration regarding the proposed sale later. (Release No. 6450).

Standard Gas & Electric Co.'s proposal to sell $51,000,000 of secured promissory notes and to use the proceeds together with $9,000,000 of Treasury funds in the redemption of $58,601,000 of 6 percent notes and debentures now outstanding has been approved. The notes, bearing 2½ percent interest per annum, are to be issued pursuant to the terms of a bank loan agreement, dated December 21, 1945, which provides that the lending banks will make available $51,000,000 upon four days' notice. The application estimated total fees and expenses to be $139,500, including a $127,500 commitment fee which Standard paid upon execution of the loan agreement. The SEC reserved jurisdiction over the reasonableness of the commitment fee. (Release No. 6435).

Tidewater Power Co.'s amended recapitalization plan filed, pursuant to Section 11 (E) of the Public Utility Holding Company Act of 1935, was approved. The amended plan provides among other things for the retirement and cancellation of existing common and preferred stocks of the company and the issuance, in exchange therefor, of 98,893 shares of new common stock. It further provides that the holders of the outstanding preferred stock shall receive four shares of the new common for each share of preferred and that General Gas & Electric Corp., as the holder of all of the old common stock, receive the remaining shares of the new common together with Tidewater's holdings of 1,870 shares of the common stock of Atlantic Utility Service Corp. (Release No. 6441).

Applications Filed

Eastern Shore Public Service Co. of Maryland and its parent, Delaware Power & Light Co., have filed a joint application with the commission for the sale by Maryland of notes and stock for construction purposes. Maryland plans to sell not more than $1,500,000 of its 4 percent notes, due October 1, 1973, and 15,000 common shares, par $100, to Delaware from time to time as may be necessary to meet its cash requirements. (Release No. 6430).

Hearings Scheduled

March 21: To consider the refinancing proposal of Illinois Power Co. Illinois Power proposes to issue and sell $45,000,000 principal amount of new first mortgage bonds, series due 1975, and $9,000,000 face amount of sinking-fund debentures, due 1966, and to publicly invite sealed bids in accordance with Rule U-50 for these securities.

UTILITY REPORTS

	Net Income 1946	1945
*Alabama Power	$5,994,872	$6,882,548
*Birmingham Electric	1,110,640	1,616,749
*Carolina Power & Light	2,458,033	2,371,467
*Consumers Power	7,739,521	7,078,525
*Detroit Edison and subs	7,906,404	6,481,730
*Georgia Power	5,362,195	4,877,149
*Ohio Edison	3,873,476	3,447,501
*Sioux City Gas & Elec.	677,073	663,155
	1945	1944
†Arkansas Power & Light	‡2,447,635	2,168,033
†Louisiana Power & Light	‡1,124,313	1,082,829
†Mississippi Power & Light	‡1,011,313	1,405,630
†Montana Power	‡3,781,574	4,168,658
†Pennsylvania Power & Light	‡4,977,437	5,645,583
†Washington Water Power	‡3,082,516	2,411,786

*Twelve months ended January 31.
†Twelve months ended December 31.
‡Preliminary.

Detroit Edison Establishes Annual Alex Dow Awards

The custom of Alex Dow, who at his death was chairman of the executive committee of the Detroit Edison Co., in according recognition to the outstanding accomplishments of employees of the utility is to be perpetuated by the annual presentation of the Alex Dow Award. The first awards will be made in 1947.

All employees will be eligible, and as many as five awards each year will be made by a committee to employees for outstanding accomplishments related in any way to the company's operations or responsibilities as a public utility.

The award will consist of a $100 United States Savings Bond, a suitably engraved watch, and a lapel button and certificate.

Basis for the award will include such accomplishments as papers, articles, and inventions in all fields or activities of the company; action to prevent loss of life or property; judgment or courage in emergencies; contributions to employee-management relations; and contributions to improved practices in dealing with the public.

Utility Sells Headquarters

Florida Power Corp. has sold its headquarters office building in St. Petersburg, Fla., to the Medical Professional Building Corp. for approximately $315,000 but will remain in the building as a tenant until it can erect a new office building.

HOW

DESIGN · CONSTRUCT · OPERATE · MAINTAIN

How A Phase Rotation Problem Was Solved

CHARLES E. WHITE

Engineer, Public Service Co. of Indiana, Inc., Terre Haute, Ind.

The engineering department issued a work order to the line department to remove a bank of two 10-kva. transformers from pole "A" and to install three 15-kva. transformers, to convert a 2-phase, 460-volt power secondary to 2-3 phase, 460-volt secondary. The new transformers were to be installed on a new pole "B," two spans away.

When the line foreman was ready to install the new transformers, he called the engineer to the job and pointed out that the primary lines to the new pole would have to be installed, according to standards, in such a way as to make it undesirable to parallel the new transformer bank with the old one. A reference to the drawing of Fig. 1 will show that the transformer leads would have to be run across the pole to reach the proper phases.

In view of the fact that there were only three customers on this bank it was decided to arrange for an interruption to service, and to connect the new transformers "straight," that is, with all leads vertically up and down the pole to the respective primary and secondary lines as indicated in Fig. 1. A test was then made to determine if rotation was still correct, and it was found that the proper rotation of all customers' equipment had been maintained. The connections shown on pole "B" in Fig. 1, of course, were not made until the transformers on pole "A" were removed, as it has already been pointed out that the two banks could not be paralleled.

In order to show why rotation would still be correct with the changes made in Fig. 1, it will be necessary to show the phase relationships in each case. An inspection of Fig. 2 will show that if the old phase "BA" is connected to "CD," and if the old phase "CD" is connected to "AB," the phase relations will be maintained as shown. Starting with "A" on each drawing and reading clockwise, it is apparent that the rotation in each case is "ACBD." What has actually happened is that the coils in customers' motors have been "traded" in relation to our own primary system. It is usually difficult to see why one of the transformers on the new transformer bank should not be reversed, as on the old transformer bank, until a study such as this is made.

•

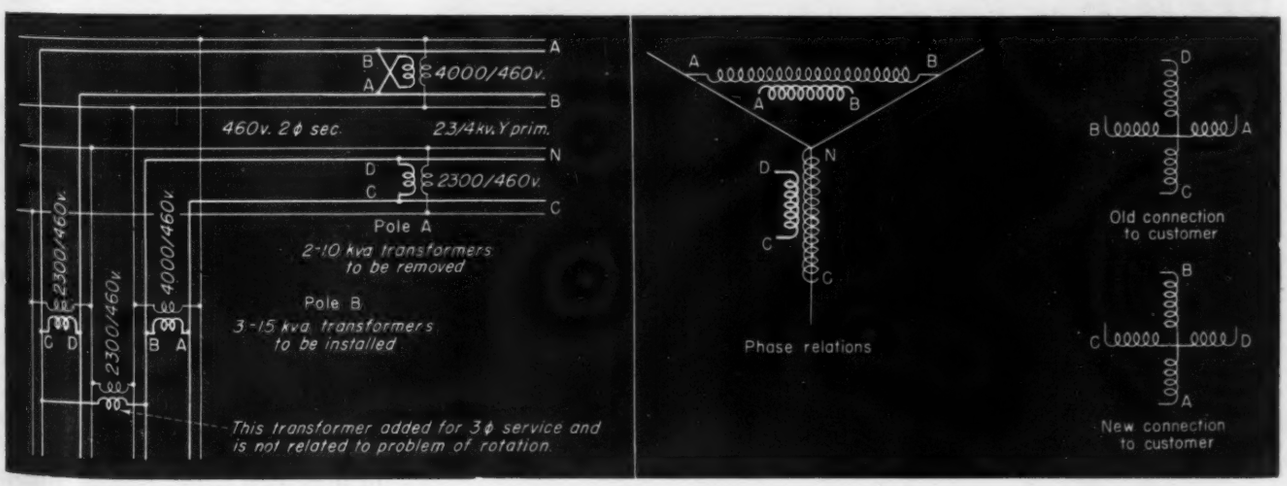
Air Gun Aids Stringing of Transmission Line

HARRY PEET, JR.

President, Kentucky Edison Co. Stanton, Kentucky

A plan is outlined which we have used to string transmission lines across deep, wooded ravines. Normally this stringing operation is a very tedious, hard and sometimes dangerous job. Operating in mountainous territory and being confronted by a few such problems, we developed an "air gun" which has proven a great time and trouble-saver.

An air receiver, 24 in. by 72 in., was



PHASE ROTATION MAINTAINED. (1, left) Connections for old and new transformer banks; (2) Phase relationships in each case

filled to 300 psi. at the generating plant and taken to the job in a pick-up truck. The tank has a 2-in. outlet valve from which was led a 2-in. pipe to a 1½-in. quick-opening whistle valve, there reducing to a 1-in. conduit, one full length of which was used as a barrel. A screw was drilled into the barrel about 6-in. from the valve to prevent the projectile from passing too far down the barrel.

The projectile was made from about 7 in. of 1-in. cold rolled steel shafting. A ¼-in. hole is drilled into the back of the projectile into which are secured two tail-hooks by a hollow-head setscrew. These hooks were made from 8A Copperweld conductor. The muzzle of the barrel was fitted with several pieces of wire held in place by hose clamps which supported the string up to the time of firing when the string was picked up by the tail-hooks as the projectile left the barrel. The projectile was heavily greased with light pressure-gun grease which furnished lubrication and considerable packing against air loss. The elbow of the air pipe was placed against a pole to prevent kick. A light, strong, tightly twisted cord on a ball that would feed out freely without turning the ball was used. Fuzzy string has too much air resistance and prevents a long shot.

With this rig we were able to carry a line over all obstacles for a distance of about 1,000 ft. On one span which was longer we fired both ways toward the center where a road passed up a ravine. Both strings were tied together and pulled up clear. The string was used to pull a small steel wire which was later used to pull in the line wires.

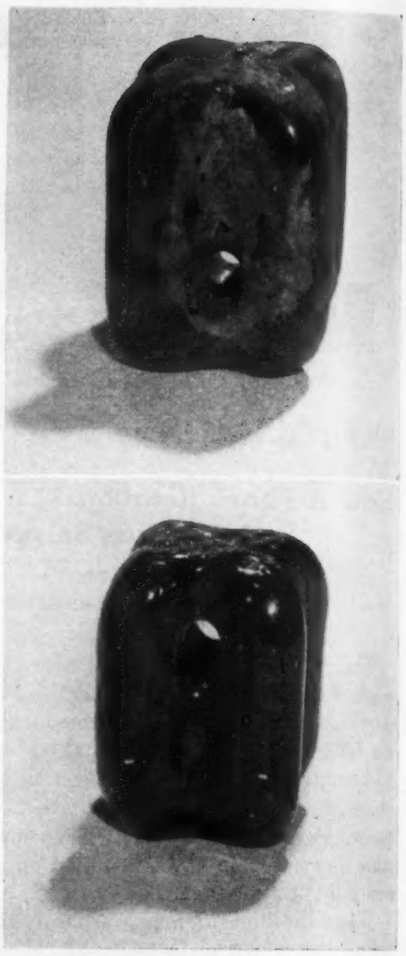
By use of this gun we estimate that we saved approximately ten man-days on each span on which it was used.

•

Strain Balls Reclaimed At Less Than $0.08 Each

R. S. PIERCE
General Line Foreman, San Diego Electric Railway Co., San Diego, Calif.

By the removal of scale from strain insulators, the San Diego Electric Railway Co. was able to restock and re-use a large number of the units during the war emergency and material shortage.



STRAIN INSULATORS before (top) and after removal of scale by solution

Sometime ago the company removed overhead lines which paralleled the ocean front in San Diego, and the insulators and strain balls were found to be coated with a combination of salts, road dust, and oil, which formed a very hard scale. The insulators were unserviceable for other construction due to the leakage on them which caused serious radio interference.

Various trials were made to find a method of dissolving the deposit, but with no great success, due to the cost of the solvent. But material became more difficult to obtain under war-time conditions, so it was necessary to try to find a way of utilizing these unfit insulators. Some samples were sent to a laboratory of Kelite Products Inc., Los Angeles, where the accompanying formula and procedure were developed.

A container made of a half of a steel barrel was used for the first dipping solution. A container made of a half of a wooden barrel was used for the Scale-Off solution. The insulators were

FIG. 1—Air gun ejects projectile with cord preliminary to stringing conductors

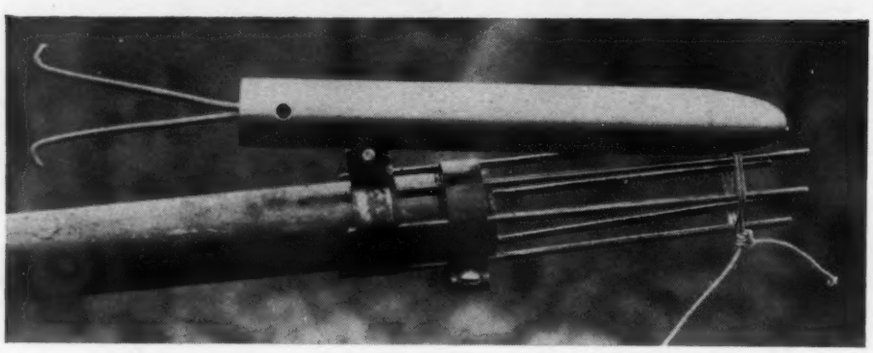


FIG. 2—Projectile temporarily above muzzle of air gun and wires supporting the cord

placed on racks (made of slats) for draining and for the two rinses. Rinsing was done by playing a hose over the insulators.

During the cleaning operation, rubber gloves were all the necessary protection for the employee.

(NOTE: For convenience, insulators can be put in a gunny sack and dipped in solution. On deterioration the gunny sacks can be discarded and new sacks used. This is a very convenient way of handling quite a few insulators at once.)

Cleaning and storing 2,000 of the insulating balls, including material for cleaning and labor, cost less than 8 cents per ball, stocked for use. Tests made on the balls after cleaning showed them to be good as a new strain insulator under wet or dry leakage conditions.

Cleaning Porcelain Insulators

1. Immerse for ½ to 1 hr. in 50-50 solution of Kelite Ketrex and water at room temperature.
2. Remove from Ketrex solution and allow to drain.
3. Rinse in water.
4. Dip in solution of Kelite Scale-Off and water for ½ hr. Mixture: 1 part Scale-Off, 5 parts water.
5. Remove and rinse in tap water.
6. Dry in sawdust.

Note: Operator should use rubber gloves.

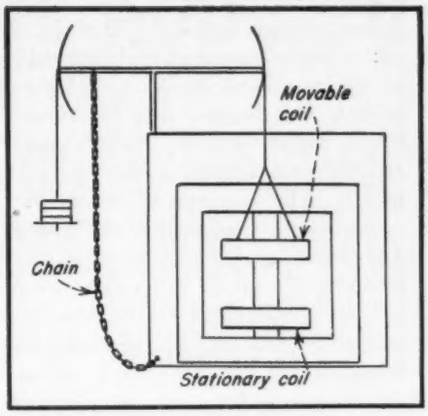
•

Tub Chain Reduces Series Lamp Burnouts

M. L. MONSON
Superintendent
Fosston (Minn.) Municipal Light & Power

A simple scheme is used to prevent bulbs in a series street lighting circuit from burning out at times when the series circuit opens and closes due to a loose or broken connection. A chain just long enough to prevent the secondary or movable coil of the series street lighting transformer from falling to the primary coil is fastened to the movable arm; the other end is fixed to the frame of the transformer, thus prevents the coil traveling to the bottom at the time the circuit accidentally opens.

If the movable coil happens to be at



CHAIN is made of such length that the movable coil will drop only slightly when series circuit is opened

the bottom of the transformer or next to the stationary coil when the circuit is reestablished, a heavy current will result in the secondary circuit and burn out bulbs in the series circuit. The chain limits the downward movement of the movable coil, thus preventing a heavy current at the time the circuit is made or completed.

•

Distribution Staff Duties Summarized*

Maintenance Supervisor

Operating check-ups are included in the duties of the maintenance supervisor and are outlined here.

When necessary the maintenance supervisor makes personal visits to investigate customers' complaints (Fig. 1) or unusual trouble. As head of trouble operators he is responsible for prompt and proper attention being given to all trouble calls. His duties include responsibility for periodic inspection of substations, transformer vaults, transformer manholes, capacitor installations, etc., and for keeping records of these. He sees to it that all pumps, fans and similar apparatus are kept in operating condition, including repair work. Frequent inspections are specified for him during unusual conditions to guard against excessive transformer temperatures. He is required to see that street lights operate properly, according to schedule, that lamps are of the proper size and kind, and supplied with correct current, that mercury rectifier sets operate satisfactorily and that a record of tubes (Fig. 2) is kept. He checks and initials all circuit map tracings for transformer sizes before blueprints are issued, and investigates all reports of defective inside wiring or apparatus made by the line inspector or others, and sees that proper action is taken. Unusual troubles are investigated and reported upon, including all cases of transformer burnouts or unusual trouble. He is responsible for a report of operating employees which records the exact times any operating department employee is heard from in any 24-hour period by telephone or in person (filled in by the trouble operator).

Responsibilities for operation of distribution circuits, also for loading, testing and inspection of transformers, were outlined in ELECTRICAL WORLD, March 2, 1946, page 96. Special tasks handled by the maintenance supervisor will be presented in an ensuing issue.

*One of a series of presentations covering the essential duties of distribution department officials in an electric utility company serving between 50,000 and 75,000 meters. First installment in ELECTRICAL WORLD, October 13, 1945, page 106.

SERVICE TROUBLE To be completed Oct 1 19 46

Date	
9 20 46	Low voltage 115 volts 3 phase power at Iowa Hoeing Co. on Elect St. Installation of capacitors on circuit 311 when secured should improve this service.

For trouble not remedied on the next working day

FIG. 1—Card record (3-in.x5-in.) of service trouble not remedied the next day

MERCURY ARC RECTIFIER TUBE HISTORY CARD No. 511900

Date Received 6-1-44 Inspected by Hansen Date 6-5-44

Initial Drying Out by Hansen Date 6-5-44

Steamed by H. Emery Date 8-20-45

Dried Out by H. Embry Date 8-21-45

Date Installed	Set No.	L	R	Static Arresters Date Installed	Date Tube Removed	Reason for Removal	Hours Operated	Date Life Ended
8-15-44	608		✓	4-14-45	6-23-45	Hard to Start	3512	
8-23-45	604	✓			6-25-45	Cracked Base	20	8-25-45

FIG. 2—Card record (5-in.x8-in.) of mercury arc rectifier tube history

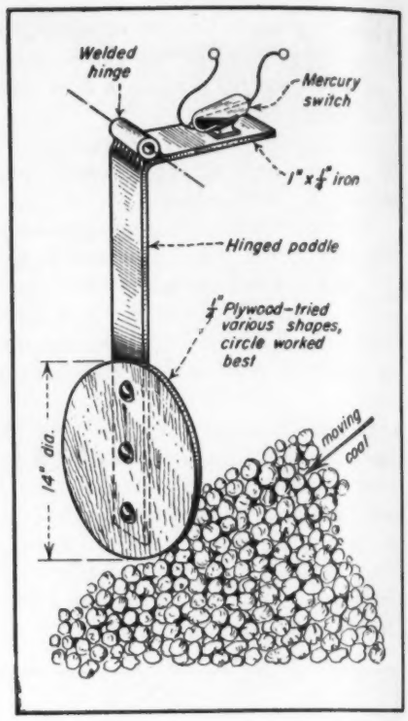
Bunker Signal System Aids Coal Handling

JOHN Q. WENDELL
Chief Electrician, New Hampshire Gas & Electric Co., Portsmouth, N. H.

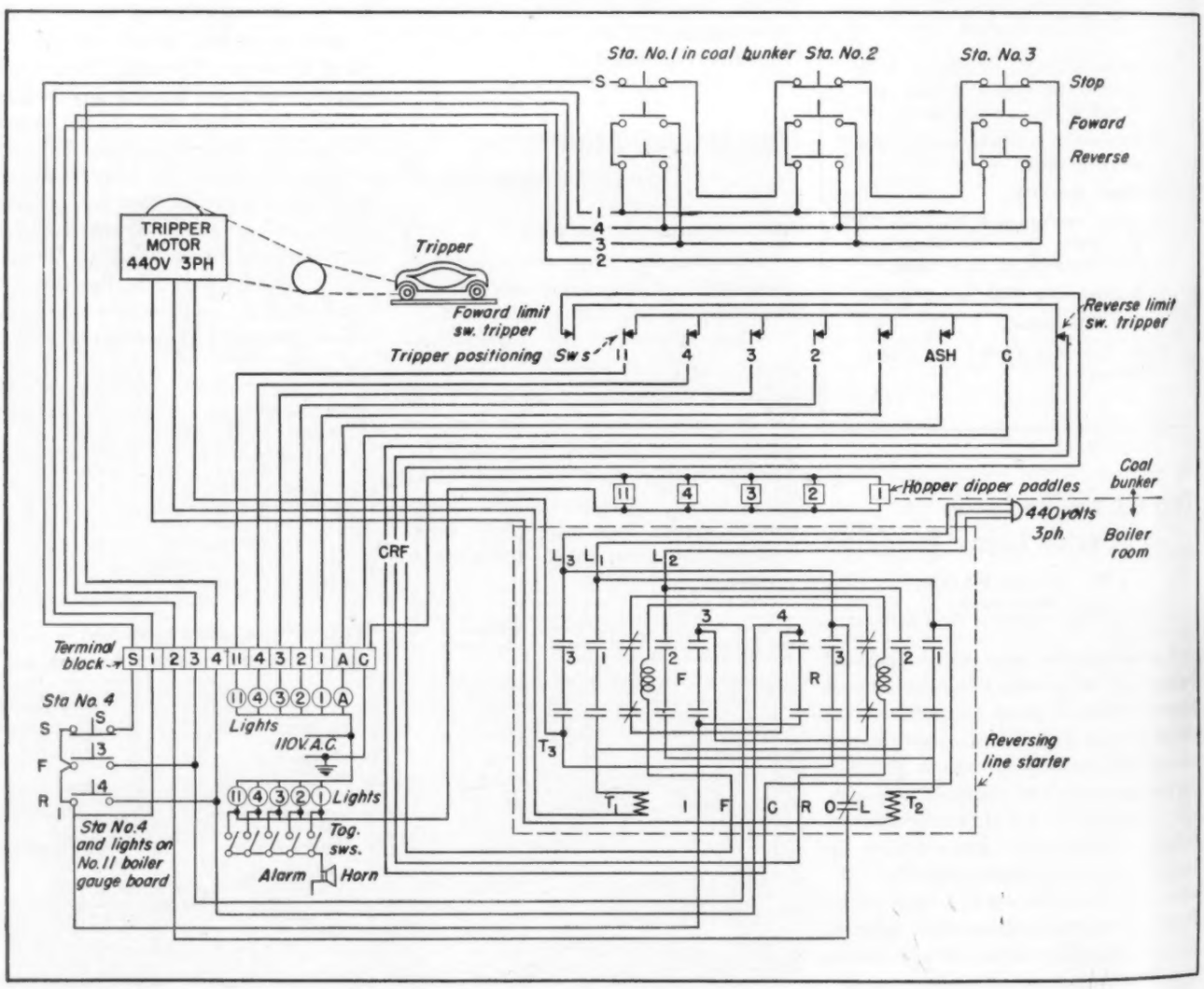
To facilitate the control of coal handling at the generating station of this company a signal system has been devised to indicate the fuel status of each bunker in coordination with the operation of the conveyor equipment. Coal is delivered to the plant by truck and dumped into an outdoor hopper, from which it is delivered by a motor-driven apron conveyor into a motor-operated peck carrier. The conveyors are electrically interlocked so that the apron conveyor will not deliver coal unless the peck carrier is running. Pushbutton stations for the operation of the conveyors are located near the receiving hopper and in the bunkers, with emergency stop switches along the peck carrier travelway.

The peck carrier is a continuous bucket system receiving coal in the boiler room basement and carrying it to the overhead bunkers. The coal buckets are dumped into the bunkers by a tripper carriage which moves along a track running along the bunker length. The carriage is driven by a cable system from a reversible motor. To operate the tripper carriage, three pushbutton stations are located at convenient points along the bunker walkway and a fourth is on the boiler gage board. Limit switches were installed in the tripper motor stop circuit to prevent overtravel, a side bar being attached to the tripper to actuate these switches.

Single contact inclosed limit switches were installed over each bunker along the tripper track. When the side bar



ARRANGEMENT of hinged plywood paddle to respond to filling of coal bunker and close signaling circuit

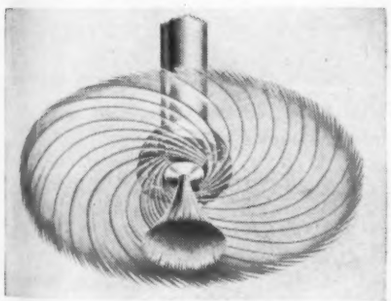


WIRING DIAGRAM of signal and control system devised for coal tripper supervision

NOZZLE-SWIRL ADDS TO CABLE LIFE

8 YEARS OF SERVICE CONFIRMS LONG-LIVED PROTECTION OF OXIDE-FREE LEAD SHEATH

More than eight years ago General Electric developed the nozzle-swirl process of applying lead sheathing to its paper-insulated cable. G-E cable, lead-sheathed by this process, found immediate acceptance. Today, eight years of service experience with this cable is giving convincing evidence that the G-E "nozzle-swirl" process adds years to cable life. In these installations, cable faults and signs of sheath weakness have been brought to a new low; trouble caused by oxidized lead in the sheathing no longer occurs.



Lead is forced through bottom hole and swirled by blades, assuring oxide-free fusion with old charge.

THE NOZZLE-SWIRL PROCESS

The presence of occluded oxides is the greatest single factor in the failure of lead sheathing of cable. When such oxides are trapped in the lead sheath, flow lines and laminations cause weak areas.

These oxides normally originate in the charging cylinder of the lead extrusion press, the surface coat of oxide on the old charge being trapped under the new charge.

The nozzle-swirl process, as shown in diagrams (right), employs a filling-spout nozzle of special design, and the injection of inert gas, to scour oxides from the junction of old and new charges. The two fuse completely, so that a homogenous mass is fed to the die block which forms the sheath around the cable.

UNIFORMITY ASSURED

This produces a lead sheath with no flaws to cause failure. G-E lead-sheathed cable is uniform in every foot of its length. There are no hidden weak spots to show up when power load variations put pressure on the sheath.

When you order G-E lead-sheathed cable, you get the only cable with this extra assurance of maximum cable life. For complete information on what it can mean in savings to you, check with your local G-E representative or ask for Bulletin GEA-2968. *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

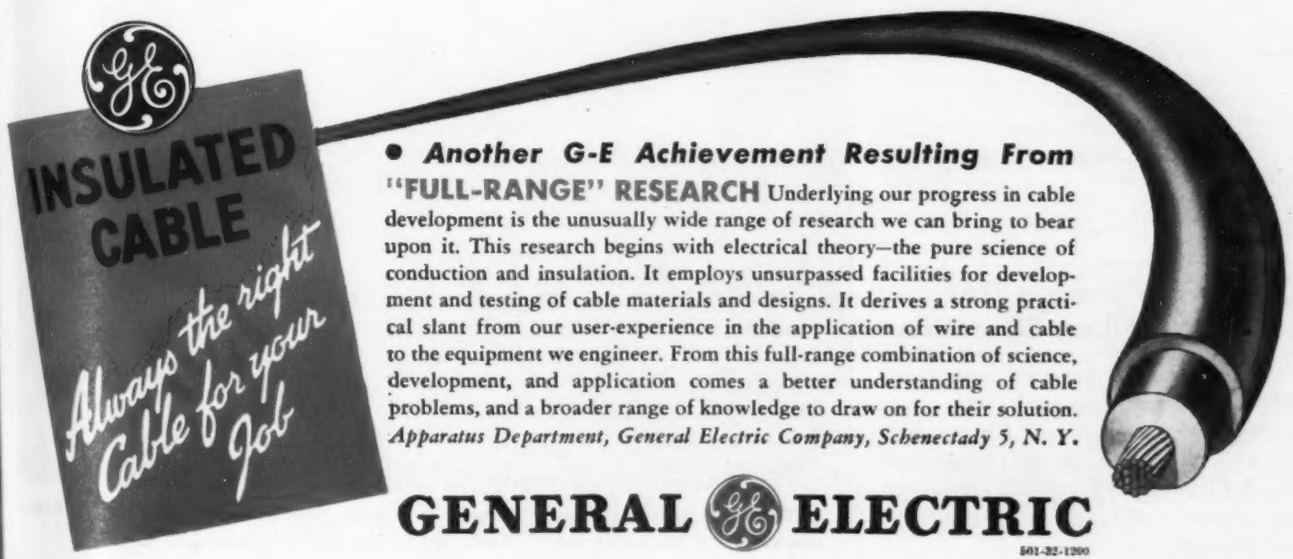
HOW SHEATH-LEAD IS KEPT OXIDE-FREE WHEN CHARGE IS ADDED

New molten lead from the special nozzle has already penetrated into the old charge. The swirling lead takes the oxides up and away from junction and shim.

The lead continues to swirl, removing the entire shim, pulling all oxides to the center, and uniting them in a ball. The new charge has now completely fused with the old charge.

The cylinder is filled, and the top of the charge containing the oxides has overflowed. The ball of oxides has been removed and the surface has been skimmed.

The lead is now solidifying and the ram has begun "packing" the charge. When the lead has been cooled, the ram will force the semiplastic mass through the die block, thus forming the sheath around the cable core.



● ***Another G-E Achievement Resulting From "FULL-RANGE" RESEARCH*** Underlying our progress in cable development is the unusually wide range of research we can bring to bear upon it. This research begins with electrical theory—the pure science of conduction and insulation. It employs unsurpassed facilities for development and testing of cable materials and designs. It derives a strong practical slant from our user-experience in the application of wire and cable to the equipment we engineer. From this full-range combination of science, development, and application comes a better understanding of cable problems, and a broader range of knowledge to draw on for their solution. *Apparatus Department, General Electric Company, Schenectady 5, N. Y.*

GENERAL ELECTRIC

501-32-1200

on the tripper operates these switches, a lamp for each respective bunker is lighted on the boiler gage board, thus indicating that the tripper carriage is over that particular bunker. To indicate when any bunker is filled, a hinged paddle was designed for mounting above each bunker. Mercury switches were attached to the extensions of the paddle hangers, and as the bunker fills, the paddle moves out and the switch completes the circuit of a corresponding signal lamp on the boiler gage board. Whenever a "bunker full" light comes on, an alarm also sounds in case the operator does not notice the lamp signal. Individual toggle switches were installed to stop the alarm after indicating the rise of the coal toward the top. The mechanical paddle and mercury switch were provided after considering various devices for coal height indication, such as photoelectric and precision switch equipment. The first-named equipment has worked out very satisfactorily, and the operating conditions and ease of coaling boilers have improved considerably since the installation of the system. The need of improving the conditions was brought forth by Charles Rowe, chief engineer of the plant, and the author was responsible for the design and construction details.

•

Cost of Short Secondary Extension

(From an eastern utility's field sheets are taken the following costs of a 5-pole extension of secondary circuit, using racks, and providing service to one customer at the end of the route. Labor costs included.)

5 40-ft. poles, extension about 330 ft. long	$166.43
2 4-pin crossarms	6.01
1,980 ft. No. 3 weatherproof wire	122.29
6 secondary racks	15.22
1 guy anchor	7.47
1 guy	11.03
1 service, at end of line	14.26
TOTAL	$342.71

•

Chain Saw Speeds Tree Felling Operations

"Lumbering" operations have been mechanized and the muscle ache eliminated from woodman's chores incident to tree trimming on the Cincinnati Gas & Electric Co. system by the power saw shown in action in the accompanying illustrations.

Trees that endanger electric service by their proximity to distribution lines can be eliminated painlessly, leaving a stump at ground level. The job is done with a 4-ft. Mall chain saw operated by a 6-hp. gasoline engine. Saw teeth are riveted together, much like a bicycle chain blade. Teeth are set and ground on an average of once a week, depending on the volume and types of wood cut, according to a report recently published in *O K News*, company employee publication.

The tool, which weighs 85 lb., is designed for two-man operation. One operator handles the throttle; the other helps to guide and hold the blade steady. The blade can be set to cut at 12 different angles and it requires no pushing or pulling by the operators.

In a time test the saw cut through a 3-ft. tree in 3 min.

POWER SAW fells trees that endanger distribution lines, leaving stump that is flush with ground. The 4-ft. saw is driven by a 6-hp. gasoline engine

CHAIN SAW teeth are riveted together like bicycle chain and rotate in a groove around thin edge of a stationary blade. Teeth are set and ground about once a week

Helps minds at work!

It's the construction of G-E ballasts that helps keep fluorescent fixtures quiet.

The distracting effects of ballast hum won't plague the employees of your customers—nor build up your complaint file—if your fixtures are equipped with G-E ballasts. Noise is *built out* of the G-E ballasts at the same time that long life is *built in.*

Constructed to exacting standards, the G-E ballast typifies G-E engineering in the various phases of fluorescent lighting. The finest low-loss core steel is uniformly rolled, stamped, and stacked as part of the *controlled quality* construction. Machine winding produces rectangular solid coils and eliminates "springy" layers, while a special sealing compound fills every void and seals the components to one another and to the ballast case.

The clamping frame is designed to prevent shifting of parts and resulting noise. Wiring is made easy by the angle slot construction which lets leads out at either ends or bottom. You can thus use one case style for many different mountings.

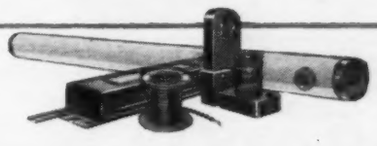
The G-E trade mark on fluorescent lighting equipment signifies the best that engineering skill and quality manufacture can produce. And remember, there is a G-E component for *every* lighting requirement. The next time you have a lighting problem, call in your local G-E representative. Our complete facilities are at your service.

Apparatus Dept., General Electric Company, Schenectady 5, N. Y.

General Electric ballasts help keep fixture users satisfied—they mean added profits for you

1. Low noise level—for satisfied users
2. Long life—for low maintenance cost
3. Characteristics matched with lamp—for rated lamp life and light output

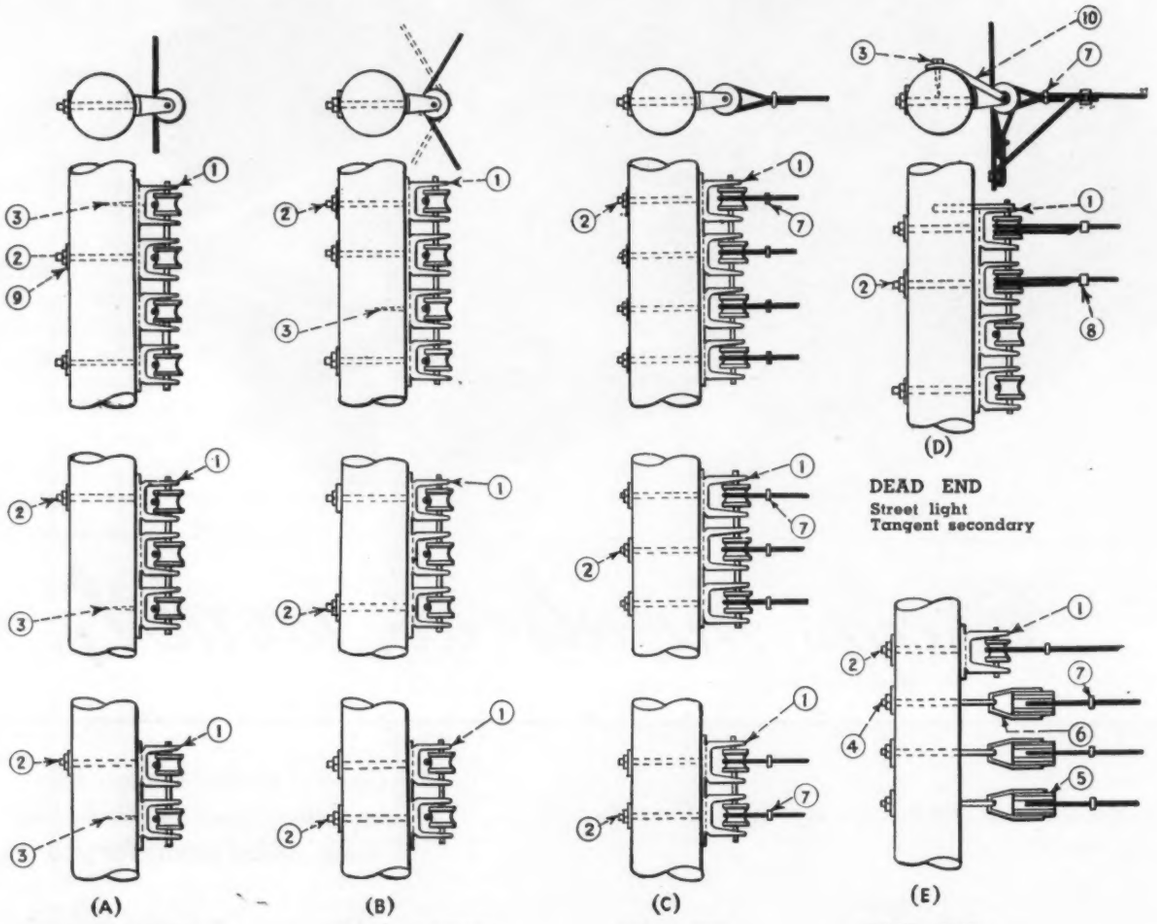
BALLASTS LAMPS STARTERS
LAMPHOLDERS CABLE
for DEPENDABILITY in fluorescent lighting



GENERAL ELECTRIC

Eleven Rack Attachments Used on Poles

Vertical racks and conductor connections are illustrated for tangent construction, angle construction, dead ends and junctions. These attachments are an adaptation from 12-kv. distribution construction standards of Memphis Light, Gas and Water Division, City of Memphis, Tenn.



TANGENT CONSTR.
Straight runs.
All wire sizes

ANGLE CONSTR.
Up to 60 deg.
No. 2 and smaller wires

DEAD END
No. 2 and smaller wires
Serve No. 4 and 6 wire

DEAD END
Street light
Tangent secondary

DEAD END
No. 1/0 and larger wires.
Note: If No. 2 wire dead ends on pole with No. 1/0 or larger wire, use same insulators and clevis as shown. Use this construction for No. 1/0 or larger wires in all cases not covered in above views, also for service take-off with No. 4/0 or larger wire.

3-WAY JUNCTION
All wire sizes

4-WAY JUNCTION
All wire sizes

CORNERS AND ANGLES
Over 60 deg.
All wire sizes

ITEM	DESCRIPTION
1.	1, 2, 3 or 4-spool racks, as shown
2.	Through-bolt, ⅝-in. galvanized, length as required
3.	Lag screw, ½-in. x 4-in. galvanized
4.	Eye-bolt, ⅝-in. galvanized, length as required
5.	Strain insulator
6.	Clevis
7.	Crosby clip
8.	Connector
9.	Square washer, 2¼-in. x 2¼-in. x 3/16-in. galvanized
10.	Dead-end strap

"THE HANDIEST TESTING INSTRUMENT WE'VE EVER HAD"

say hundreds of users

MEASURES BOTH

VOLTS AND AMPERES

(ACCURACY 3%)

G-E HOOK-ON VOLT-AMMETER

You get double value from this handy, portable, a-c instrument. It will measure up to 600 volts and up to 600 amps. Just hook it around the conductor, push to close the gap, and read the current. Leads are provided for voltage measurements. Booklet GEA-2950 gives complete details, prices, and many helpful suggestions for operating this versatile instrument. Ask your G-E representative or write General Electric Company, Schenectady 5, New York.

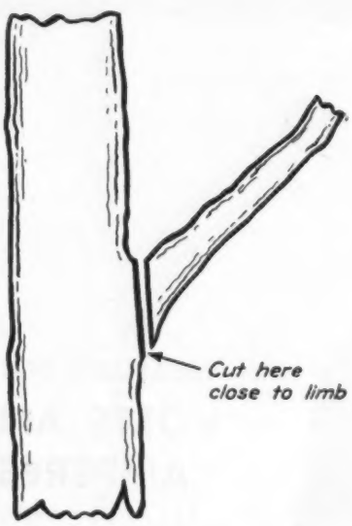
HEADQUARTERS FOR MEASUREMENT

GENERAL ELECTRIC

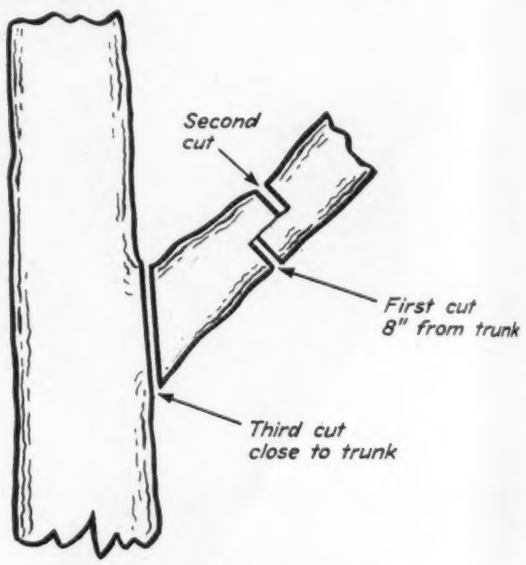
602-94-6300

A GUIDE TO TREE TRIMMING

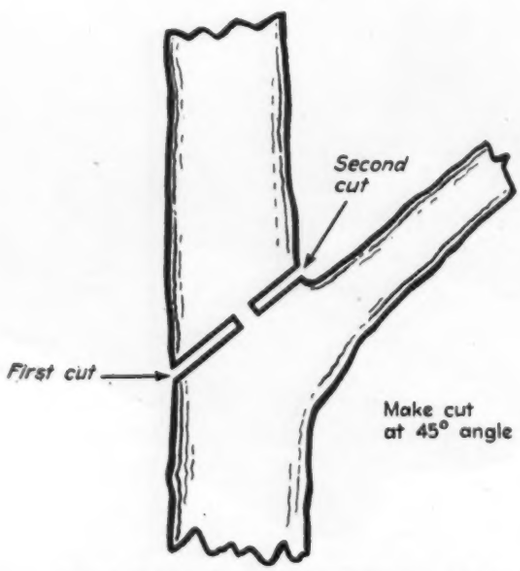
Where and how to make cuts, sequence of cuts and angle of cuts for removal of small, large and vertical limbs; also an outline of a properly trimmed tree, particularly with respect to clearing the interior, providing for air circulation through the center and along the main branches, pruning for shape and retaining a suitable clearance for conductors above the tree; an adaptation from Standards of Overhead Construction of Central Hudson Gas and Electric Corp., Poughkeepsie, N. Y.



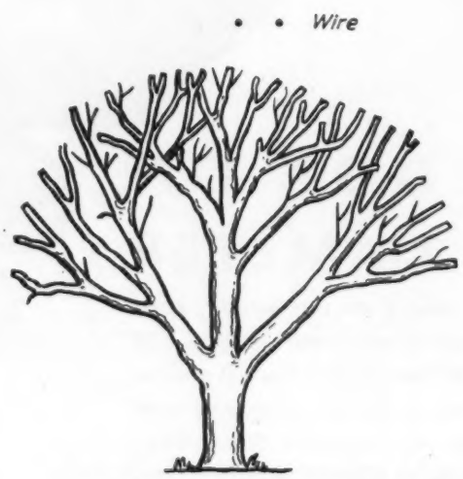
1 — CUTTING SMALL LIMB



2 — CUTTING LARGE LIMB



3 — REMOVING VERTICAL LIMB

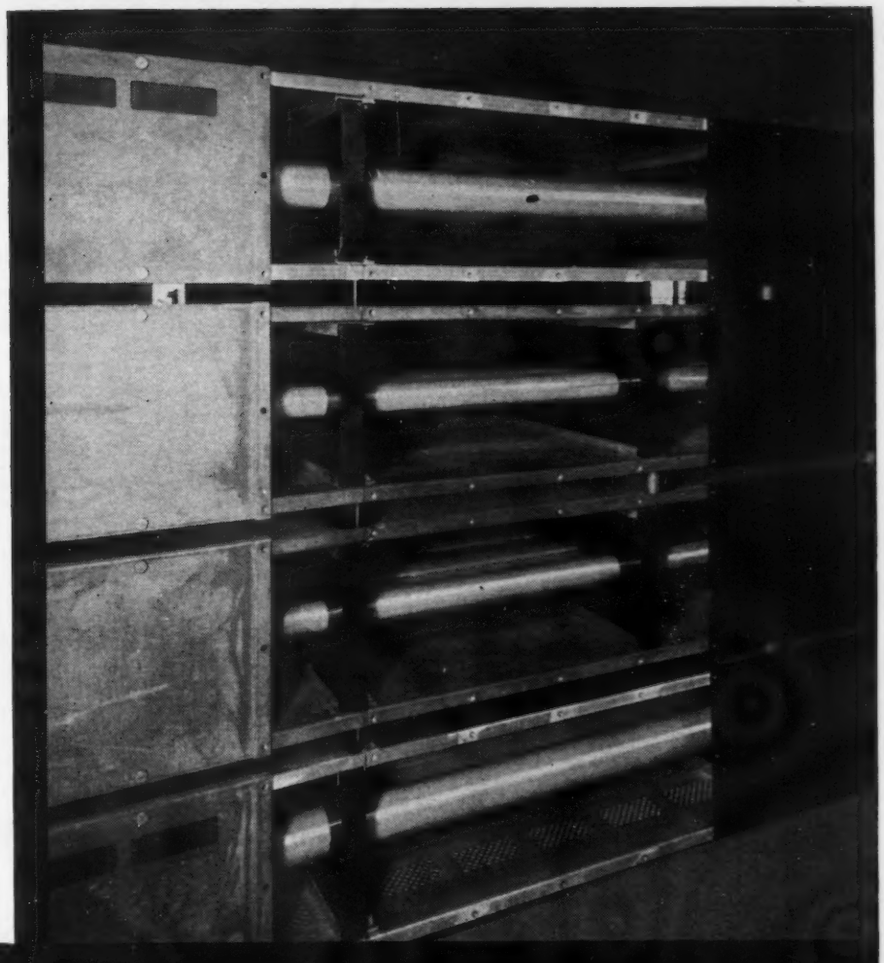


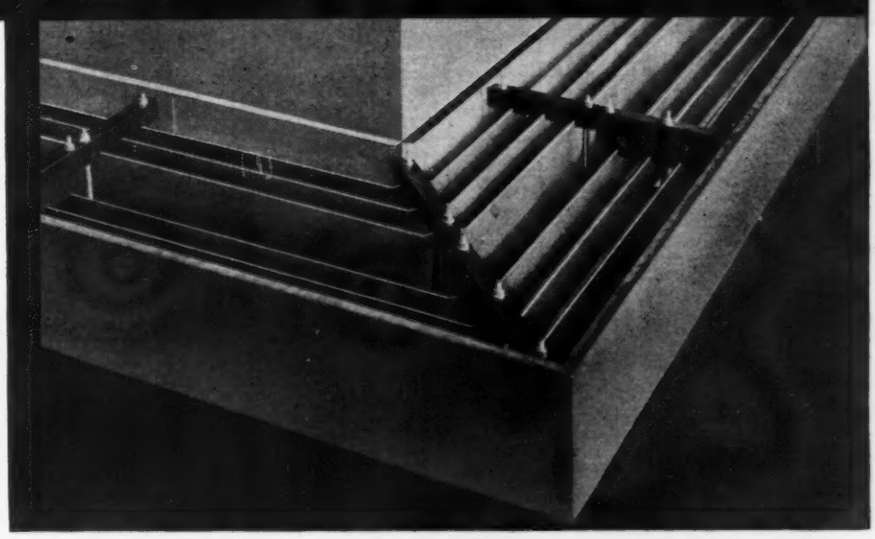
4 — PROPER TREE TRIMMING

NOTES:

1. Always use saw for cutting
2. Paint all wounds with dark green lead and oil paint
3. Shave off all dead and splintered wood from wound before painting

REVERE really knows BUS BAR





WHEN copper became a vital war metal because such large quantities of it were needed for ammunition and other top priority uses, Revere was asked if it could make bus bars out of pure silver. We said "YES!" even though processing of silver for such a purpose had never been attempted. By the end of the war, Revere had produced 36,000,000 pounds of silver bus for aluminum and magnesium plants.

Today, copper bus bar by Revere is back, in all the usual forms, rectangular, round, square, etc. When planning or remodeling an electrical installation, ask Revere to quote on your bus requirements. Other Revere products of interest to those generating or using electricity are condenser tubes and plates, specially-prepared switch copper, copper and brass pipe and tube, commutator bars.

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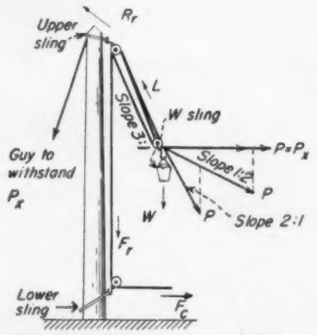
RIGGING GUIDE FOR HOISTING TRANSFORMERS

II—Three-Sheave Block Method; Load Line Slope 3:1‡

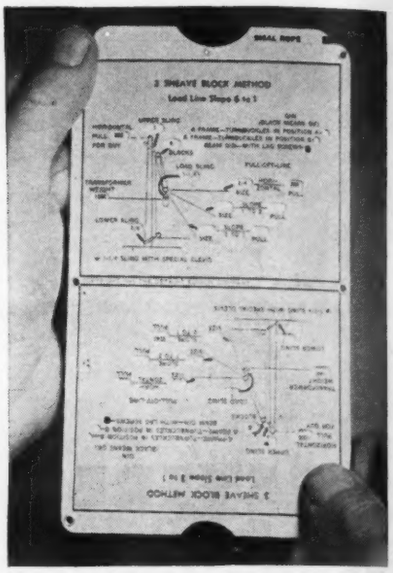
ARTHUR W. CHEWNING, Estimating and Operating Division, Overhead Lines Department, Detroit Edison Co., Detroit, Mich.

Strength values of tackle blocks, slings and pull-off lines used in calculations are based on tests conducted by the company research department. Certain tackle blocks which were critical war tools were not tested to destruction but a safety factor of five was applied to the manufacturers rating. A safety factor of three was applied to all tested blocks. Rope strengths are based on the published values of the Plymouth Cordage Co., and a safety factor of five used.

Values in this and similar tables for other rigging arrangements have been incorporated in a slide rule (shown) for quick and easy reference in the field. Copyright to this slide rule is owned by Detroit Edison Co.



Three-Sheave Method. F_c = pull exerted by capston. F_r = fall line pull. L = pull on load lines. P = pull on pull-off line. P_x = horizontal component of P. R_r = becket block reaction



Slide rule incorporates tabulated data. Reverse side (shown) arranged for three sheave method; opposite (front) side for snatch block method

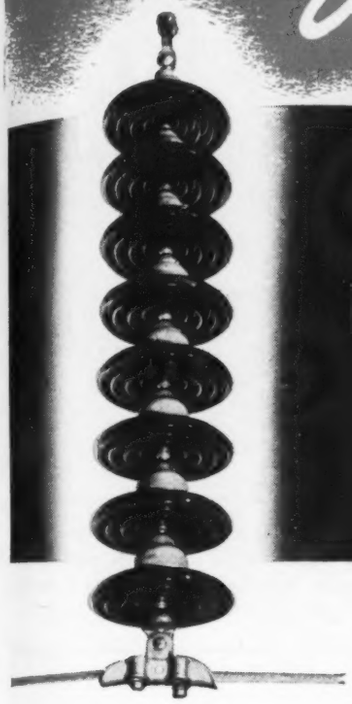
Rigging Data for Hoisting Transformers; Assumed Load Line Slope 3:1

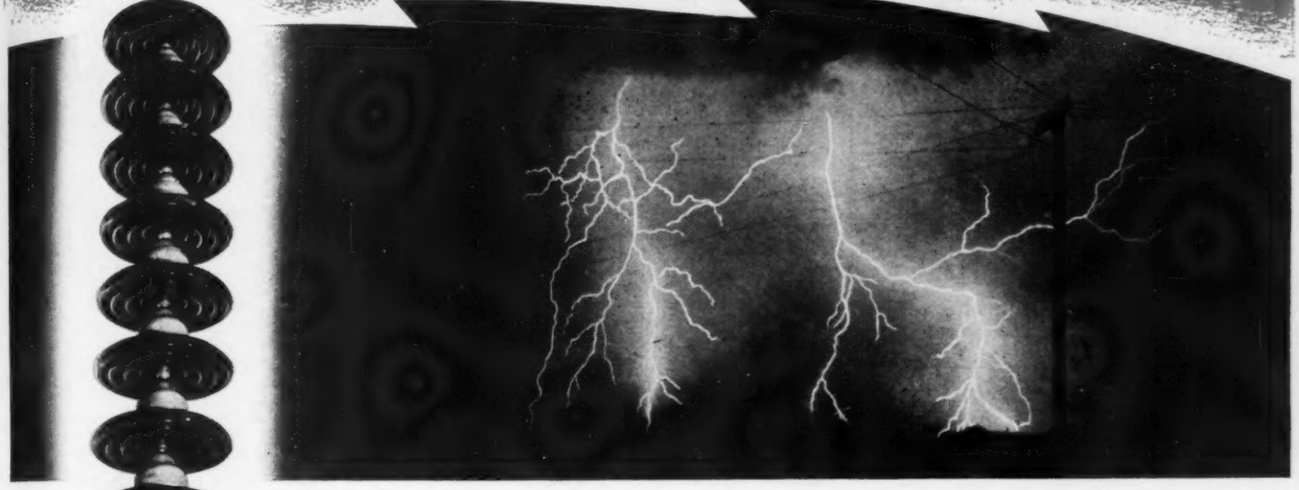
W lb.	L lb.	F_r L/3.6 lb.	F_c 1.18 F lb.	R_r L + F_r lb.	P lb.	P_x lb.	Blocks Size, in. M	Blocks Size, in. S	W Sling, in. M	W Sling, in. S	P Line, in. M	P Line, in. S	Upper Sling, in. M	Upper Sling, in. S	Lower Sling, in. M	Lower Sling, in. S
Pull-off Line Horizontal, Slope = 0																
100	105	29	34.2	134	33.4	33.4										
200	210	58	68.4	268	66.8	66.8	3	3	1/2	1/2	1/4	3/8	1/2	1/2	1/2	1/2
400	420	116	137	536	133.6	133.6	3	3	1/2	1/2	3/8	1/2	1/2	1/2	1/2	1/2
600	630	174	205	804	200.4	200.4	3	3	1/2	3/4	1/2	1/2	1/2	3/4	1/2	1/2
800	840	232	274	1072	267.2	267.2	3	4	3/4	1	1/2	3/4	3/4	1	1/2	1/2
1000	1050	290	342	1340	334	334	4	4	3/4	1	3/4	3/4	3/4	1	1/2	1/2
1200	1260	348	410	1608	400.8	400.8	4	4	1	1	3/4	3/4	1	1	1/2	1/2
1400	1470	406	480	1876	467.6	467.6	6	6	1	1 1/4	3/4	1	1	1	1/2	3/4
1600	1680	464	548	2144	534.4	534.4	6	6	1	1 1/4	3/4	1	1	1	1/2	3/4
1800	1890	522	616	2412	601.2	601.2	6	6	1 1/4	1 1/4	1	1	1	1 1/4	3/4	3/4
2000	2100	580	685	2680	668	668	6	6	1 1/4	6 M	1	1	1	1 1/4	3/4	1
2500	2625	725	855	3350	835	835	6	8	6 M Str.		1	1 1/4	1 1/4	†	3/4	1
3000	3150	870	1025	4020	1002	1002	6	8	6 M Str.		1 1/4	1 1/4	*	†	1	1
3500	3675	1015	1200	4690	1169	1169	8	8	6 M Str.		1 1/4	1 1/4	*		1	1
4000	4200	1160	1370	5360	1336	1336	8	8	10 M Str.		1 1/4		*		1	1
Pull-off Line Slope 1:2																
100	126	35	41.3	161	44.7	40.0										
200	252	70	82.6	322	89.4	80	3	3	1/2	1/2	3/8	3/8	1/2	1/2	1/2	1/2
400	504	140	165	644	178.8	160	3	3	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2
600	756	210	248	966	268.2	240	3	4	1/2	3/4	1/2	3/4	3/4	3/4	1/2	1/2
800	1008	280	330	1288	357.6	320	4	4	3/4	1	3/4	3/4	3/4	1	1/2	1/2
1000	1260	350	413	1610	447.0	400	4	4	3/4	1	3/4	3/4	1	1	1/2	1/2
1200	1512	420	495	1932	536.4	480	6	6	1	1	3/4	1	1	1	1/2	3/4
1400	1764	490	579	2254	625.8	560	6	6	1	1 1/4	1	1	1	1	3/4	3/4
1600	2016	560	660	2576	715.2	640	6	6	1	1 1/4	1	1 1/4	1	1 1/4	3/4	3/4
1800	2268	630	744	2898	804.6	720	6	6	1 1/4	1 1/4	1	1 1/4	1	†	3/4	1
2000	2520	700	826	3220	894.0	800	6	6	1 1/4	6 M	1	1 1/4	1 1/4	†	3/4	1
2500	3150	875	1030	4025	1117.5	1000	6	8	6 M Str.		1 1/4	1 1/4	*	†	1	1
3000	3780	1050	1240	4830	1341.0	1200	8	8	6 M Str.		1 1/4		*		1	1
3500	4410	1225	1445	5635	1564.5	1400	8		6 M Str.		1 1/4				1	1
4000	5040	1400	1650	6440	1788.0	1600	8		10 M Str.						1	1 1/4
Pull-off Line Slope 2:1																
100	316	87.8	103.8	403.8	224	100										
200	632	175.6	207	807.6	448	200	3	3	1/2	1/2	3/4	3/4	1/2	3/4	1/2	1/2
400	1264	351.2	414	1615.2	896	400	4	4	1/2	1/2	1	1 1/4	1	1	1/2	1/2
600	1896	526.8	622	2422.8	1344	600	6	6	1/2	3/4	1 1/4		1	1 1/4	3/4	3/4
800	2528	702.4	830	3230.4	1792	800	6	6	3/4	1			1 1/4	†	3/4	1
1000	3160	878.0	1038	4038.0	2240	1000	6	8	3/4	1			*	†	1	1
1200	3792	1053.6	1240	4845.6	2688	1200	8	8	1	1			*		1	1
1400	4424	1229.2	1450	5653.2	3136	1400	8		1	1 1/4					1	1
1600	5056	1404.8	1660	6460.8	3584	1600	8		1	1 1/4					1	1 1/4
1800	5688	1580.4	1865	7268.4	4032	1800			1 1/4	1 1/4					1	†
2000	6320	1756.0	2070	8076.0	4480	2000			1 1/4	6 M						
2500	7900	2195	2590	10095	5600	2500			6 M Str.							

* 1¼ in. M sling with special clevis. † 1¼ in. S sling with special clevis. M—Manila rope. S—Sisal rope.

‡ Snatch block method was outlined in ELECTRICAL WORLD, March 2, 1946, page 98. For a correction see page 128 of this issue.

WHAT MAKES A "LIGHTNING PROOF" LINE *Lightning Proof?*





A case in point: This 26-mile line was built in 1917 at 66 Kv., and raised to 132 Kv. in 1922. So far, in spite of good inspection, not one O-B insulator has come out of service due to any inherent defect. This is a highly significant fact to the engineer contemplating lightning-proof construction, and needing absolutely reliable insulation.

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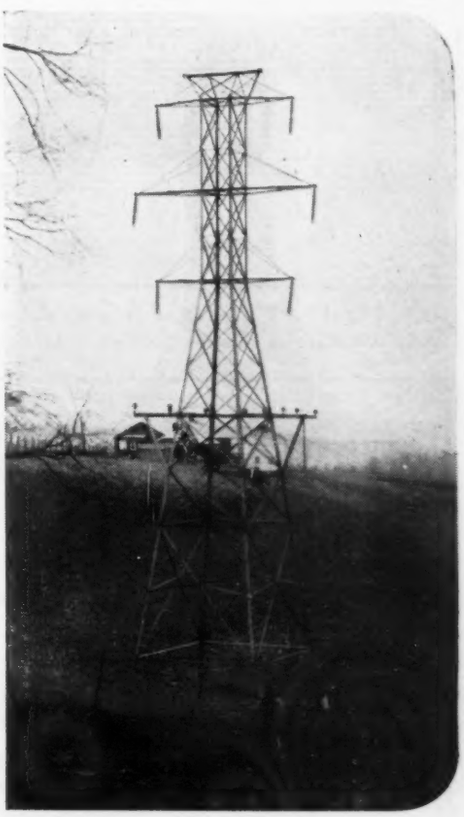

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Watts and Vars On A Single Chart

C. D. PRICE

Electrical Engineer, Columbus & Southern Ohio Electric Co., Columbus, Ohio

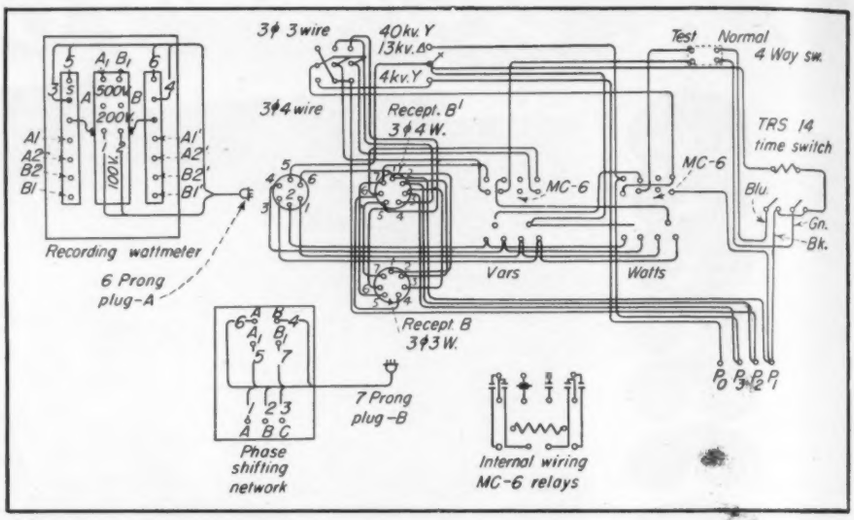
Necessity for securing a large number of circuit load records on the Columbus & Southern Ohio Electric Co. system a few years ago led to the revision of a scheme used by Central Illinois Electric & Gas Co.* to give increased flexibility in handling and connecting instruments in the field. Both schemes produce a record of kilowatts and kilovolt-amperes reactive on a single recording wattmeter chart. Also both schemes can be used on 3-phase, 3- or 4-wire circuits.

The revised scheme used on the Columbus system employs an Esterline-Angus model AW graphic a.c. wattmeter having four current and two potential coils. This instrument has a 0 to 1.0 scale but the zero may be shifted to 0.3 whenever necessary. A phase shifting network for the potential source is provided so that kilovars may be recorded by the instrument as well as kilowatts.

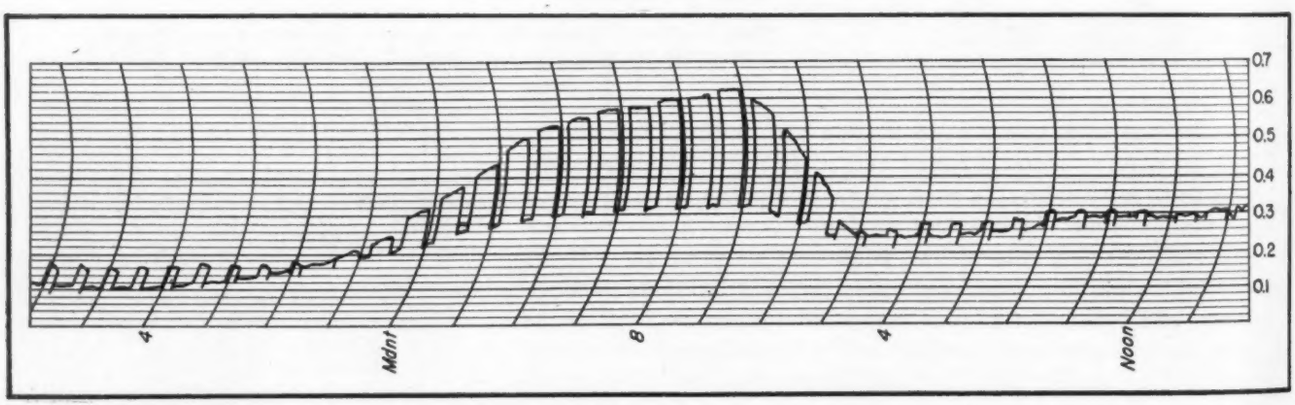
* See ELECTRICAL WORLD, March 21, 1942, page 104.

Accompanying wiring diagrams show the various manual and automatic switching facilities provided on the potential control panel. Radio-type plugs and receptacles are used to permit quick connection and disconnection of recorder and network potential leads.

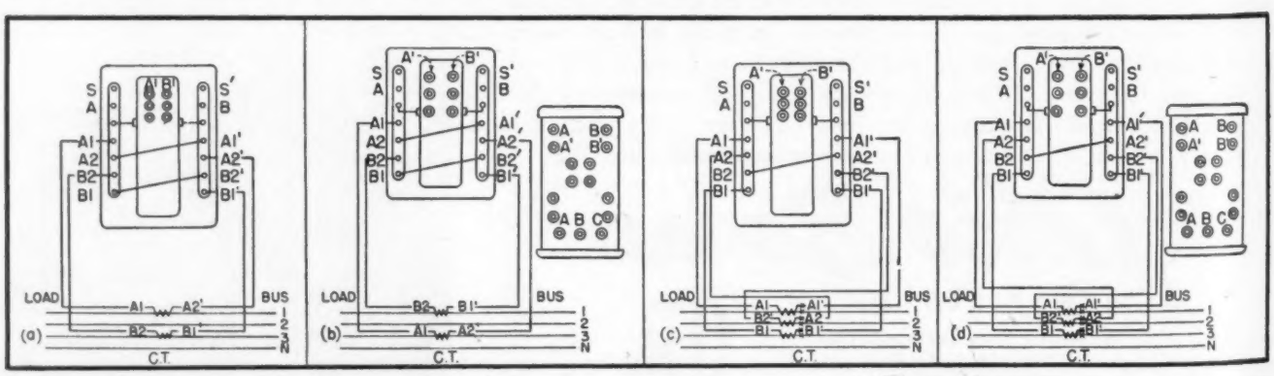
The chart sample shown reveals that a 10-min. interval is used for kilovar recording and a 20-min. interval for kilowatt recording. Switching of meter connections in accordance with this schedule is done by a time switch arrangement. Importance of a long and short interval is evident from the



POTENTIAL CONTROL PANEL incorporates various manual and automatic switching facilities for securing watt and var record on same chart. The recording wattmeter plugs into receptacle "A"; and the phase shifting network plugs into receptacle B or B' depending on whether circuit is 3-phase, 3-wire or 4-wire



WATT-VAR RECORD produced by a single recording wattmeter. Auxiliary switching arrangement permits wattmeter to record watts for 20 minutes and vars for 10. Full scale (1.0 index) for chart is 2,400 kw.—2,400 rva.



WATTMETER CURRENT COIL CONNECTIONS used on 3-phase, 3-and 4-wire circuits. (a) For 3-phase, 3-wire circuit current coils in series, (b) to record kvar on 3-phase, 3-wire circuit, (c) for 3-phase, 4-wire circuit and (d) to record kvar on 3-phase, 4-wire circuit

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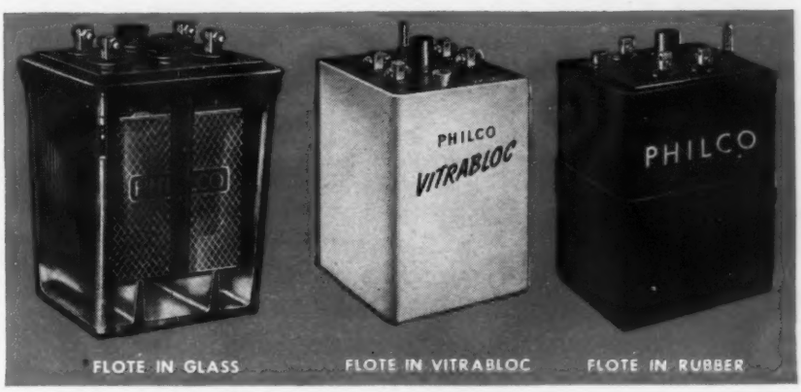

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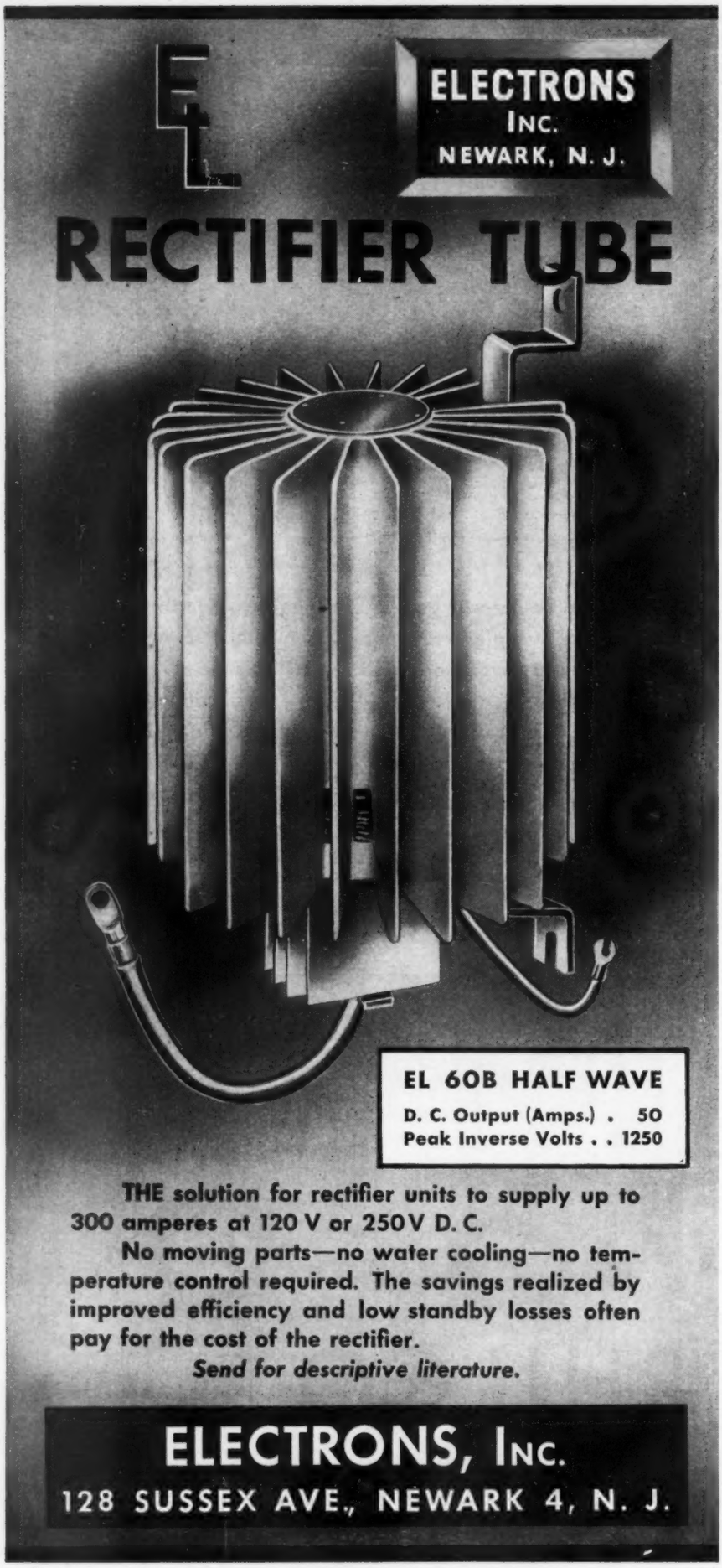
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chart which shows that kilowatt and kilovar curves cross. If a differential in time interval were not used there are cases where it might be difficult to distinguish between the two curves.

This metering arrangement has been in use on this property for some three years and to date has apparently proved quite satisfactory. Other users may find that revisions are necessary to fit the method into their own method of switchboard wiring.

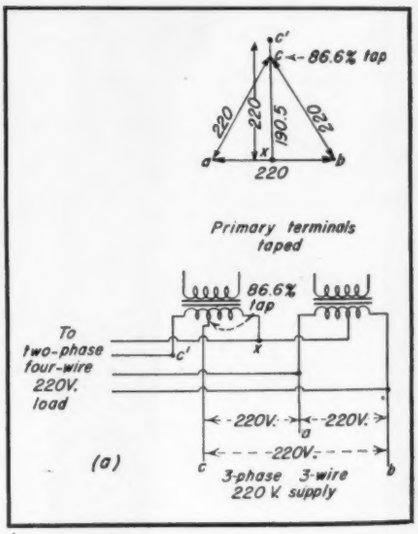
•

Gets Two-Phase From Three-Phase Supply

JOHN GIBSON
Fort Wayne, Ind.

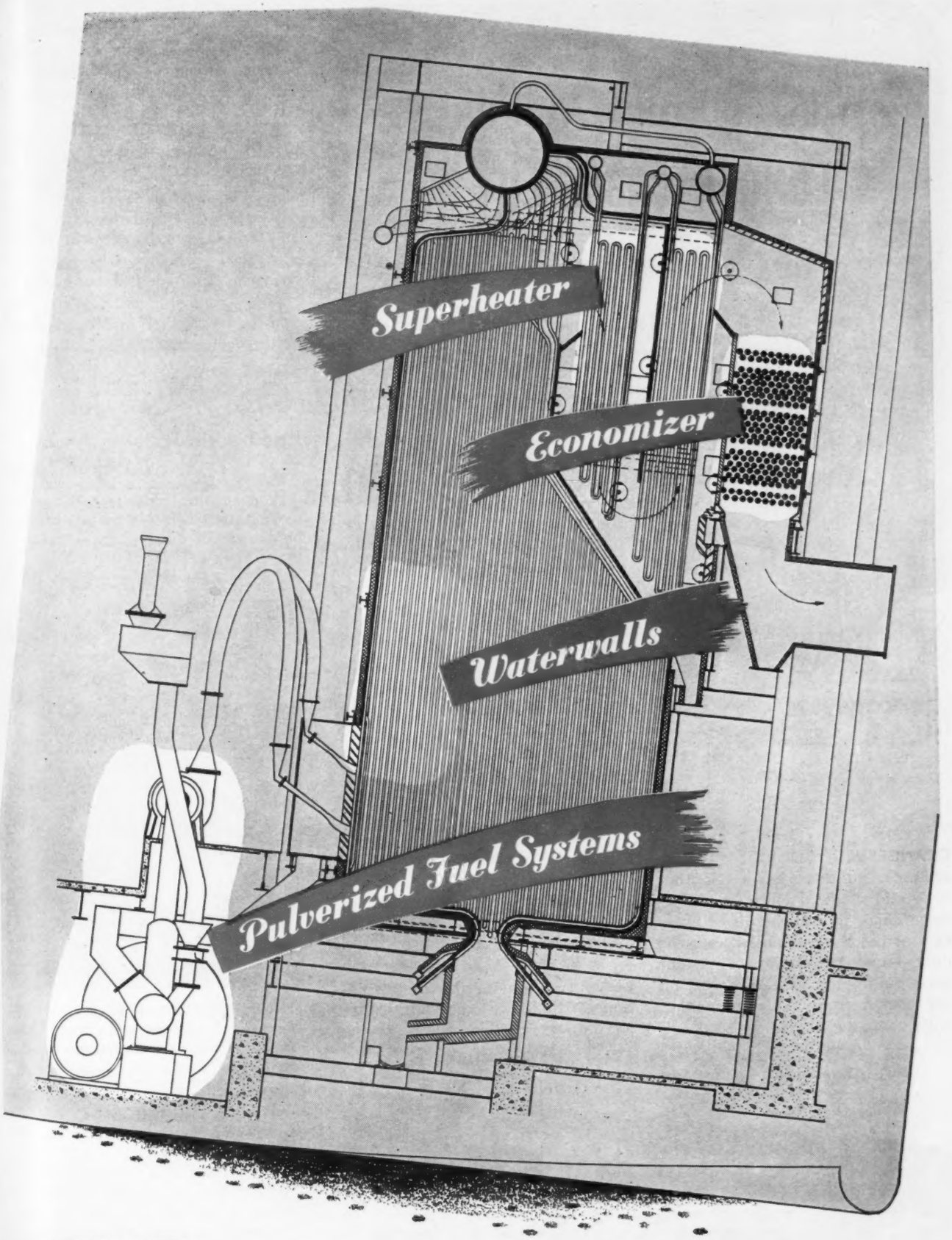
For phase conversion on power system or as an emergency connection for securing two-phase, four-wire service from three-phase, three-wire supply the illustrated transformer connection has proven useful.

As shown (a) the connection is used for 1:1 conversion from three-phase to two-phase using the secondary wind-



THREE-PHASE to two-phase, four-wire transformer connection

ings of the transformer only. Primary leads are taped up to prevent their being short-circuited, grounded or otherwise in trouble. Where this connection is to be used for long periods of time, one of the two transformers should have an 86.6 percent tap. The transformer with this tap should be connected to the middle of the secondary of the other unit, as shown. However, in an emergency and where load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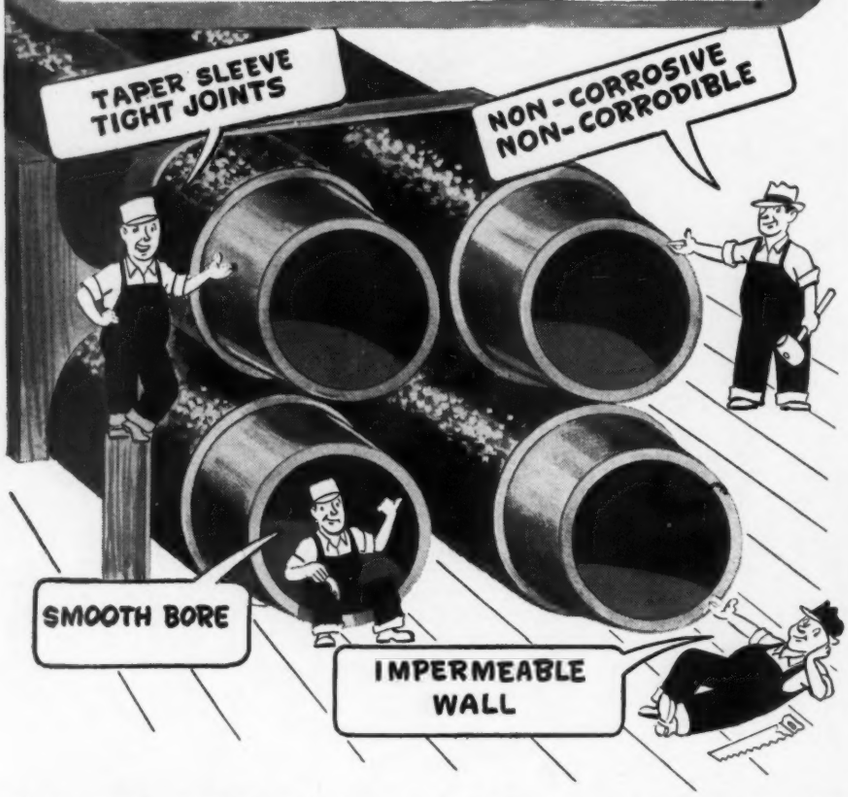
WHAT CONDUIT ASSURES LONGER CABLE LIFE?



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equipment will stand the resulting unequal two-phase voltages, a transformer without an 86.6 percent tap can be used for a short time in the "T."

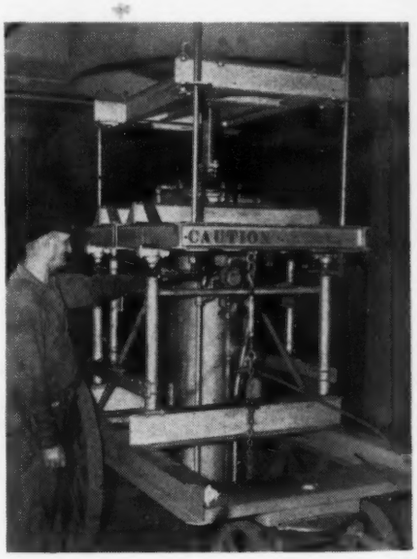
The voltages in the three-phases are equal to those across any phase of the two-phase system only when the 86.6 percent tap is used. When an 86.6 percent tap is not available, voltage on one of the two phases will be low.

With the primary windings Scott-connected and supplied from a three-phase source, this secondary connection can be used to provide either two- or three-phase secondary service.

•

Pneumatic Hoist For Breaker Tanks

A pneumatic hoist is used for removing and replacing tanks of 66-kv., outdoor-type, oil circuit breakers at the Crawford Station of the Common-

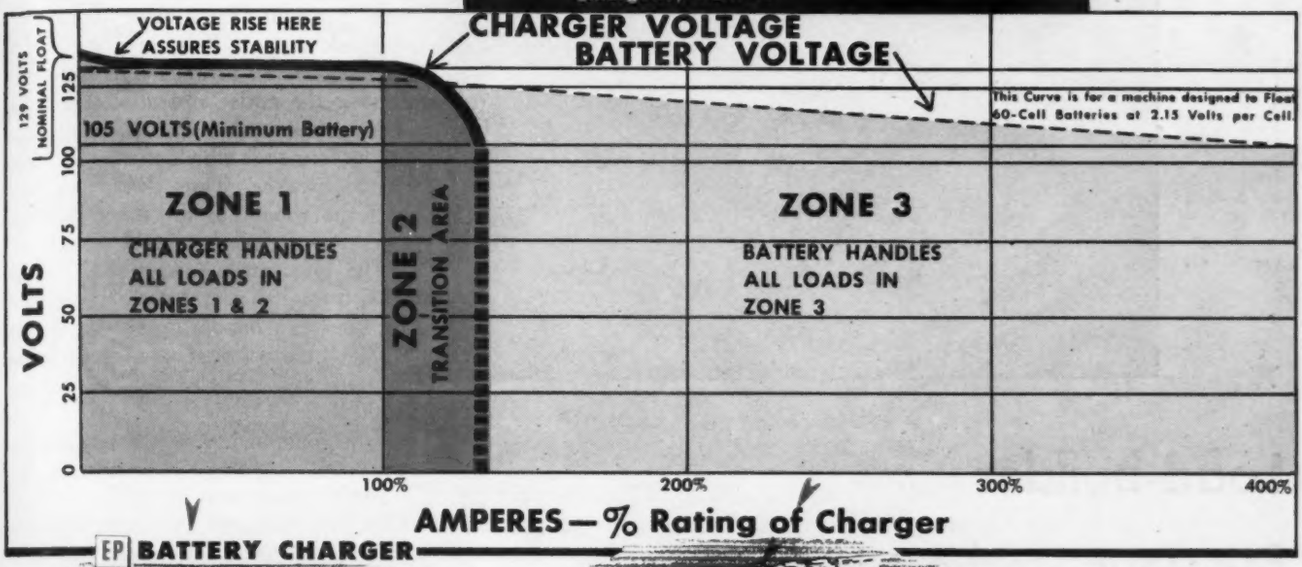


PNEUMATIC HOIST of the type used on service station grease racks handles 66-kv. circuit breaker tanks with ease

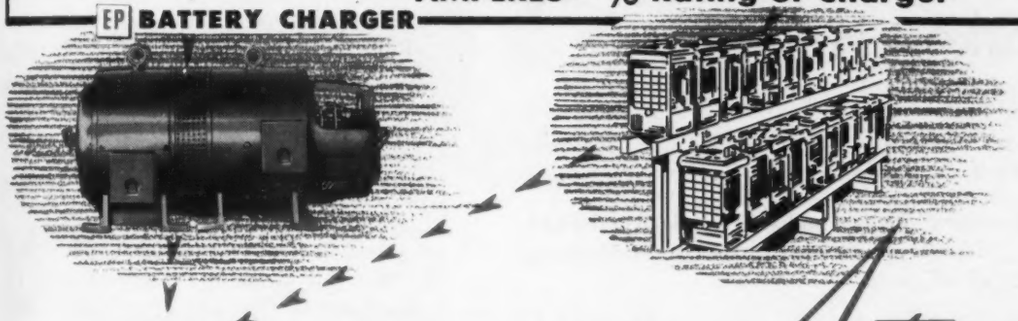
wealth Edison Co., Chicago. Developed by the oil switch repair section of the station electrical division of the company's construction department, the device, shown, is an adaptation of a conventional air hoist of the type used on grease racks in gasoline service stations.

The mechanism is mounted on a wheeled framework so that it can be moved into place under the breaker on which work is to be done. To use the hoist four long 1¼-in. steel rods, that are bolted at their lower ends to the hoist framework, are screwed into bolt

PROVED PERFORMANCE FOR:
Tripping and Closing of Circuit Breakers
Operation of Indicating Lamps, Relay Holding Coils, Contactors
Emergency Lighting



EP BATTERY CHARGER



THEY SHARE THE LOAD *Automatically* WITHOUT ATTENTION

Assuring an adequate and uninterrupted supply of direct current (for control bus, circuit breaker and emergency loads) . . . automatically and without manual attention . . . DEMANDS the "teaming together" of only the most dependable Batteries and Full-Automatic Chargers. That the "Diverter-Pole" Charger ranks at the top of the list is supported by the thousands of installations made in the past 30 years . . . PROOF that the "Diverter-Pole":

ASSURES MAXIMUM BATTERY LIFE . . . Only the "constant-voltage" method of charging protects the battery against over-charging during the Floating-Charge period. Analyze Zone 1 of the above graph.

PROTECTS ITSELF AGAINST HARMFUL OVERLOADS . . . As shown in Zone 2 of the graph, the "Diverter-Pole" changes from a "constant-voltage" charger into a "constant-current" one, before overloads become dangerous.

SHARES LOADS WITH BATTERY . . . The "constant-voltage" characteristic permits the "Diverter-Pole" to carry *all* loads within its *safe* capacity. The change to a "constant-current" characteristic (Zone 2) shifts *automatically* dangerous overloads to the "team-mate" battery operating in Zone 3.

GIVES FULL-AUTOMATIC OPERATION . . . Increasing use of "Diverter-Poles" in isolated automatic and supervisory-controlled substations is convincing evidence that this type of charger needs only infrequent inspection. Its voltage *automatically* remains constant despite fluctuations in the load or the a-c power supply.

"Diverter-Pole" chargers are available in capacities from 250 watts to 200 kilowatts; in voltages from 5 to 500 volts; and for any standard power supply.

Write for Descriptive Bulletin No. 96-A

EP X-5

THE ELECTRIC PRODUCTS COMPANY
1731 CLARKSTONE ROAD CLEVELAND 12, OHIO

Load-builder for your Darkest Hours

New midnight-to-morning load-builder—the G-E Automatic Blanket—*goes to work when your customers go to sleep.*

This "electrically-warm" Blanket builds up your load in the darkest hours. *Two* G-E Blankets equal one six-foot refrigerator in energy consumption—and all off peak!

Newly efficient, newly lightweight and soft, these Blankets pioneered by G-E before the war, reappear much improved as the impressive result of vast wartime research and use.

Tell your customers about the bliss of sleeping snugly warm under a soft, warmed, single layer of blanket.

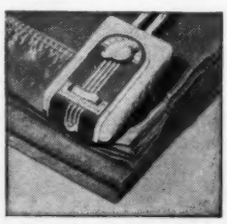
As a matter of fact, they may be around asking *you*. For they've been reading about G-E Blankets for months in such magazines as *Life, Good Housekeeping, House Beautiful,* and *This Week*. They hear about the Blankets on the famous radio show, "The G-E House Party," too.

Write us today for suggestions as to how you can help build this load. General Electric Co., Appliance and Merchandise Dept., Bridgeport, Conn.

FOR GOOD LISTENING: *Don't miss Art Linkletter, in "The G-E House Party," every afternoon, Monday through Friday, 4 p. m., E. S. T., CBS.*

Automatic Blanket

"Goes to work when the lights go out"



GENERAL ELECTRIC

holes in the *head of the breaker*. Nuts on the lower end of each rod are drawn up until the entire hoist mechanism is free of the ground. Then, by means of a valve, the hoist platform is raised until it supports the breaker tank. After the tank support bolts are removed it can be lowered to the required height. During the entire operation the hoist remains suspended free of the ground by the four rods which engage the head of the breaker. Thus these rods support the weight of the hoist plus the weight of the breaker tank.

The pneumatic hoist which is supplied from 100 psi., station-compressed air lines can handle breaker tanks up to 54 in. diameter. These largest tanks contain 655 gal. of oil and weigh 7,600 lb.

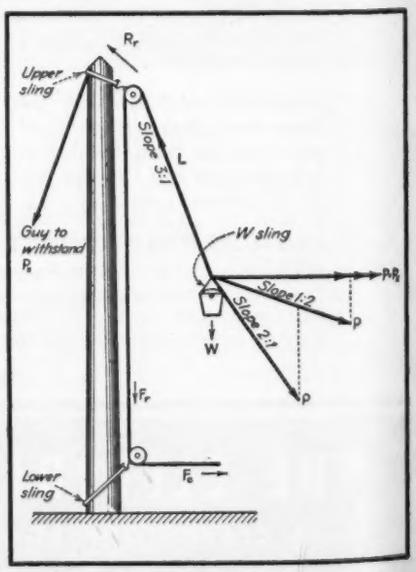
Four men using the hoist can inspect and repair six phases in ten hours where formerly, using a chain hoist, six men were required to inspect and repair two phases in the same time. Built at a cost of approximately $1,000, the hoist has, therefore, already saved several times its original cost.

•

Correction

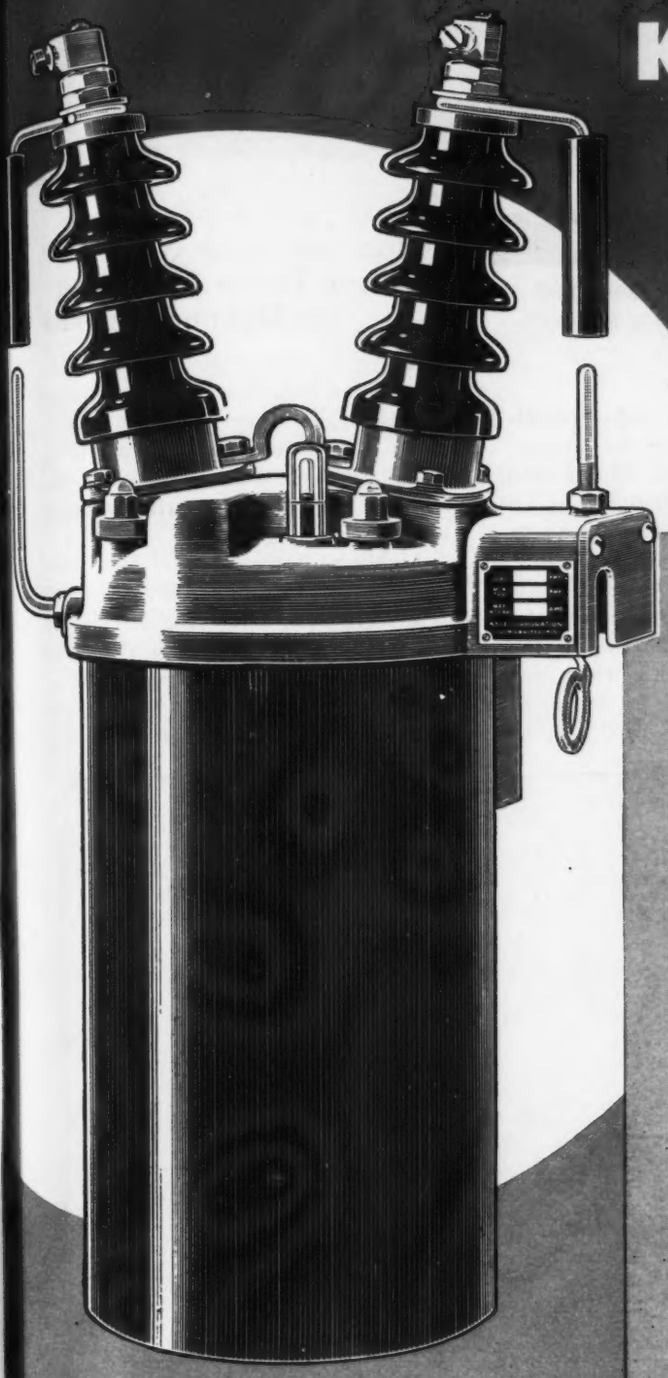
For the article entitled "Rigging Guide for Hoisting Transformers" in ELECTRICAL WORLD, March 2, 1946, page 98, the subtitle line should read "I—Snatch Block Method; Load Line Slope 3:1" instead of ". . . Slope 2:1".

Accompanying illustration is the correct diagram for the snatch block method; whereas the diagram in that article is for a three-sheave block method. The latter method is outlined on page 118 of this issue.



SNATCH BLOCK method of hoist rigging

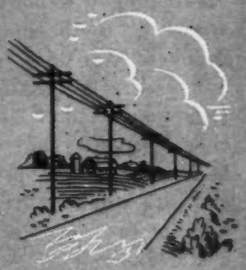
KYLE OIL CIRCUIT RECLOSERS WILL INCREASE YOUR REVENUE



by

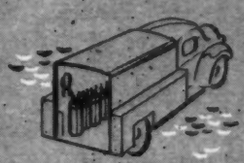
Keeping More of Your Lines in Service

Greater continuity of service on extended rural lines is possible with Kyle Type "H" Oil Circuit Reclosers than is provided by any other economical form of protection. Their use provides instant and automatic clearance of all temporary faults . . . with no interruption in service. Permanent faults are isolated to short branch lines by virtue of the fact that Kyle Reclosers may be coordinated with sectionalizing fuses.



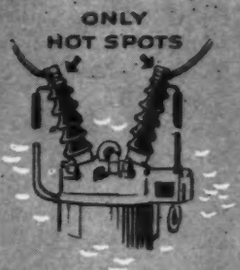
Reducing Maintenance Costs

This automatic elimination of common line faults reduces the number of service trips required. Isolation of branch lines on permanent faults makes for quicker, easier location of line difficulties. Dependable Kyle hydraulic operation . . . without clockwork or motors . . . requires service only at rare intervals. Small, compact, flat-based Kyle Recloser tanks are easily carried in service trucks.



Providing Safe, Trouble-Free Operation

Kyle Reclosers are easy to handle and safe to install and service. Only live parts are the upper terminals on the bushings, providing easy, safe access to the operating handle. This operating handle is trip-free. The Recloser may be manually closed without any danger to the operator. Vibration or jar cannot cause the Recloser to "fall closed" accidentally.



Let your Line Material Representative show you why Kyle Oil Circuit Reclosers are the economical answer to your line protection needs.

Ratings of Kyle Type "H" Oil Circuit Reclosers

Voltage	2400 to 15,000
Ampere Rating	5, 10, 15, 25 or 50
Minimum Tripping Current	10, 20, 30, 50, 100 Amperes
Interrupting Capacity	150, 250, 375, 600, 1200 Amperes

MADE BY KYLE CORPORATION SOUTH MILWAUKEE WISCONSIN

KYLE Circuit Reclosers are Designed and Manufactured for LINE MATERIAL COMPANY MILWAUKEE WISCONSIN

LOAD BUILDING

Commercial
Industrial

Residential
Rural

Reporting Application Loads Connected

A. D. SPILLMAN.

Supervisor, Market Studies and Applications Division, Philadelphia Electric Co.

A method of reporting loads by application was inaugurated by the Philadelphia Electric Co. in its industrial engineering divisions of the sales department. For many years the company has recognized the importance of keeping a record of loads added according to the application. This is beneficial not only to its sales group but also to the engineering and operating departments in analyzing the characteristics of industrial loads added, how they are being supplied and also what the trend for the future may be among the larger industrial customers.

In order to maintain a more complete record, a form was prepared, "Report of Application Loads Connected—Electric," for use by representatives of the industrial engineering divisions, market studies and applications division, and the industrial service division. Application loads connected are recorded at the time an agreement for new or additional business is signed or when it is determined through other sources that the load will be connected.

The five main divisions by application are: lighting, heating, air conditioning, cooking and baking, and others. The first four of these, as shown on the form, are further subdivided.

Under operating data are listed the various pieces of equipment connected, kw. connected, kw. demand, hours' use, connected kw.-hr., and annual revenue. Further details are given under List of Equipment and its application. When more than one application is reported, separate operating data is given for each application in order to facilitate segregating the load for the monthly report which is prepared at the end of the month.

We now have records on this method of reporting since January 1, 1944, and by continuing this procedure it will be possible to analyze loads by application from year to year.

We also find that information of this kind is valuable to the manufacturers and members of the Electrical Association of Philadelphia, as it is a measure of equipment sales and may serve as a guide in future activties or campaigns to further increase the sale of equipment, as well as add to the load on lines of Philadelphia Electric Co.

REPORT OF APPLICATION LOADS CONNECTED - ELECTRIC

FORM 196-11304 10-43

DATE INSTALLED Feb. 1945

CUSTOMER I. L. E. CO.

PLANT ADDRESS Philadelphia

P. O. ADDRESS

APPLICATION

LIGHTING	INCANDESCENT ☐	FLUORESCENT ☐	MERCURY ☐		OTHERS ☐
HEATING	RESISTANCE ☐	INFRA-RED ☒	MELTING ☐	INDUCTION ☐	OTHERS ☐
AIR CONDITIONING	DEHUMIDIFICATION ☐	COMFORT ☐	REFRIGERATION ☐	VENTILATION ☐	OTHERS ☐
COOKING AND BAKING	INDUSTRIAL ☐	INSTITUTION ☐	COMMERCIAL ☐	RESTAURANT ☐	OTHERS ☐

OTHERS

OPERATING DATA

CONNECTED LOAD	KW.	DEMAND KW.	HOURS/MONTH	MONTHS/YEAR
Infra red ovens	346	346	185	12

MONTHLY CONSUMPTION KW.-HR.	ANNUAL CONSUMPTION KW.-HR.	ESTIMATED ANNUAL REVENUE
64000	768000	$8867

LIST EQUIPMENT AND DESCRIBE APPLICATIONS: Customer is installing 1 - 214 KW and 1 - 132 infra red ovens for paint drying. Contract signed 2-9-45.

REMARKS:

REPORTED BY: G.W.F. 2-13-45 APPROVED: V.F.A. MANAGER, INDUSTRIAL ENGINEERING

CHECKED BY: G.W.F. DATE 2/26 19 45

When more than one Application is reported separate Operating Data should be given for each Application.

FORM developed for reporting application loads connected

Common Faults Appearing In Lighting Systems

An aid to better lighting during winter months and under rapidly changing conditions may mean better diffusion, better focusing, freedom from glare, reflection, shadow, or sharp contrast. It does not necessarily mean installing more lighting units.

Lighting systems are always deteriorating and common faults which appear have been listed in a circular of the National Electrical Manufacturers Association. It is pointed out that most of the faults are easy to correct and that by doing so there may be a sub-

Better Methods Electric Program!

You, too, are cordially invited to participate . . .

You simply tie-in your rural activities with this national program that is *right now* operating in your territory. It is not necessary for you to *develop* or *originate* new materials to identify your organization with the Better Methods Electric Contest.

FREE HELP for promoting your own Better Methods Electric Program

GUIDE BOOK – Explains Better Methods and how to apply them in simple, understandable language. Packed with factual information on farm and home jobs and chores.

REPORT FOLDER – Contains convenient blank forms for 4-H'ers to develop and report their Better Methods Electric Projects.

LEAFLET – A complete explanation of each step of the Contest, also rules and regulations . . . for widespread distribution to 4-H'ers.

POSTER – For display in your showroom windows in your farm territory – to establish them as information stations on the Electric Contest.

FARM BULLETINS – Twelve Bulletins on the many and varied uses of electricity on the farm and in the farm home.

IDEAS – Many useful suggestions to help you conduct your locally-sponsored Better Methods Electric Program.

Westinghouse

PLANTS IN 25 CITIES OFFICES EVERYWHERE

IT'S EASY TO GET STARTED!

To start the Better Methods Electric Program working for you, send for the new portfolio: "A Rural Community Service Program." In it you will find samples of the free material described above, and other helpful information. *Contact your nearest Westinghouse Office – or mail coupon, now!*

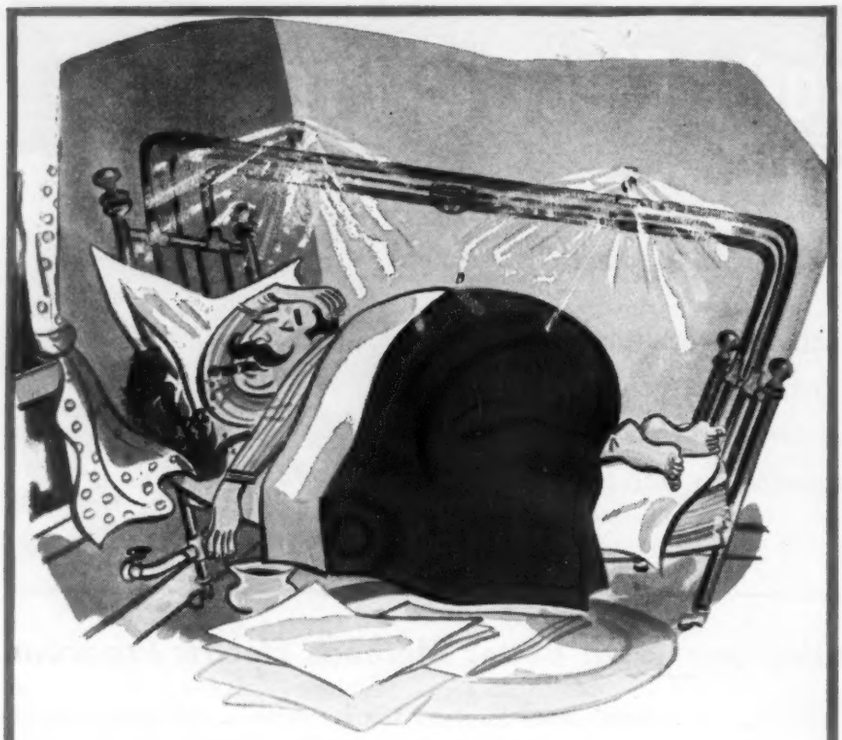
Tune in: JOHN CHARLES THOMAS—Sun., 2:30 pm, EST, NBC
TED MALONE—Mon. thru Fri., 11:45 am, EST, American Network

MAIL THIS COUPON TODAY

Rural Electrification Section (EW-36)
Public Relations Department
Westinghouse Electric Corporation
Box 1017, Pittsburgh 30, Pennsylvania

Please send *free copy of*
"A Rural Community Service Program."

Name .....
Position .....
Company .....
Address .....
City ..... Zone ..... State .....



"IT'S BETTER TO SOAK IN BED
THE 'AUTOMATIC' WAY
THAN TO GO UP IN SMOKE
LIKE A BALE OF HAY"

But seriously, fire protection for *every* business is an essential. And the design and development of this protection is the one thing to which "Automatic" has devoted its entire business career. Let us assist in planning definite "Automatic" Sprinkler fire protection for you.

—a famous member of the "Automatic" Sprinkler Family. Provides adequate protection for quench tank, transformer, oil line and other fires of flammable liquid origin.

"Automatic" Sprinkler

"AUTOMATIC" SPRINKLER CORPORATION OF AMERICA

YOUNGSTOWN, OHIO . . . . . OFFICES IN 36 CITIES

"Automatic" Sprinkler manufactures and installs a complete line of fire protection devices and systems for all types of fire hazards. Listed by Underwriters' Laboratories, Inc., and approved by Factory Mutual Laboratories.

COPYRIGHT 1946, AUTOMATIC SPRINKLER CORP. OF AMERICA

stantial increase in production almost immediately. The list suggests how big is the room for improvement and how easy the opportunity.

Common faults for correction are:

1. Dirt on lighting equipment.
2. Direct glare.
3. Reflected glare.
4. Daylight glare.
5. Reflected glare from daylight.
6. Line vision glare.
7. Glare from multiple sources.
8. Point light source reflections.
9. Daylight reflection on eye glasses.
10. Specular reflection.
11. Interfering shadows.
12. Line-light shadows.
13. Poor illumination on procedure charts.
14. General illumination inadequate.
15. Vibrating light units.
16. Too little light for fine adjustments.
17. Inadequate lighting for inspection.
18. Little or no general lighting.
19. Not enough light to see quickly.
20. Contrast on desk tops.
21. Improper color conditions.
22. Dark wall contrasts.
23. Lack of paint.

•

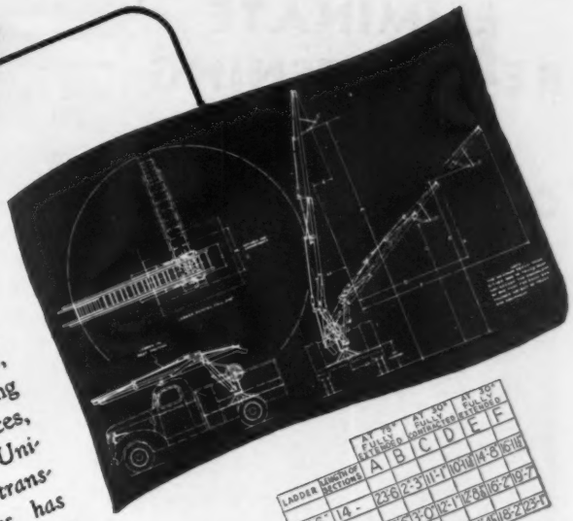
Fluorescent Tubes Used For Seed Propagations

Using ordinary 30- and 40-watt fluorescent lamps as the source of light, home gardeners who do not have access to greenhouses can now propagate cuttings and seedlings in their own basements or storage rooms in an enclosed unit developed by the U. S. Department of Agriculture.

A unit 6 ft. long, 3 ft. high and 3 ft. wide for use with a fixture containing two 40-watt fluorescent tubes is suggested. If the unit is to be carried through doors, the width may be 2 ft. with only one tube. Two doors hinged at the top are provided for the front of the unit. Ventilation is unnecessary. Construction of waterproof composition board is suggested, especially if insulation is important.

The unit, as designed and tested at the Plant Introduction Garden, Glenn Dale, Md., has (1) a heated or warm air space below, (2) the rooting medium in a flat or trays with drainage, (3) fluorescent lamps and reflecting surface, and (4) an air space above the lamps to prevent excessive heating. Relatively little watering of the root-

American — IMPROVED — REVOLVING AERIAL LADDER



This revolving aerial ladder really gives you safe mobility.

New method of counter-balancing eliminates the heavy dead weight. So easy to raise, lower or revolve, a child can do it . . . with one hand.

Instead of a few positions, you now have 40 spotting positions in a complete revolving radius of 360°.

Can be mounted on most any size truck body, even one as narrow as 46". Yet the ladder will clear any obstacle, such as parked cars.

The ladder has dozens of uses, servicing overhead street lights, other maintenance work, trimming trees, reaching inaccessible places, inspecting cable and trolleys. *Universal use by power, telephone, transportation and other utilities has proved economy of this revolving ladder.*

LADDER	LENGTH OF SECTIONS	AT 75° ELEVATION EXTENDED A	B	AT 50° ELEVATION EXTENDED C	D	AT 10° ELEVATION EXTENDED E	F
23'-6"	14' - 9½"	23'-6"	2'-3"	11'-10"	14'-6"	16'-11"	
26'-6"	16' - 9½"	25'-6"	3'-0"	12'-1"	16'-6"	19'-7"	
30'-6"	18' - 9½"	30'-6"	4'-0"	13'-0"	14'-4"	18'-2"	23'-1"

Write for the engineering-styled bulletin containing the complete profit story on the American Revolving Ladder or ask us about the ladder on your next visit to The American Coach & Body Co., Cleveland, Ohio, largest manufacturers of utility equipment for motor vehicles.

- UNIFORM BALANCE REGARDLESS OF ANGLE
- 40 SPOTTING POSITIONS IN 360°
- TURNS COMPLETE CIRCLE IN AS NARROW A BODY AS 46"
- NEW TYPE SAFETY LOCK

"Baker-American"—Baker Equipment & Engineering Co., Richmond, Va., Sales and Assembly

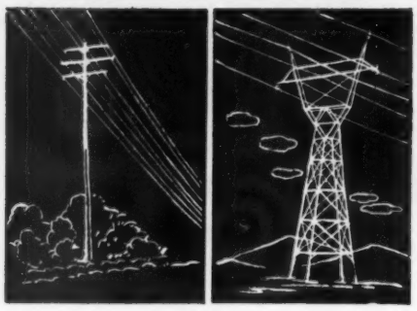
THE American COACH and BODY COMPANY

9503 WOODLAND AVE., CLEVELAND 4, OHIO

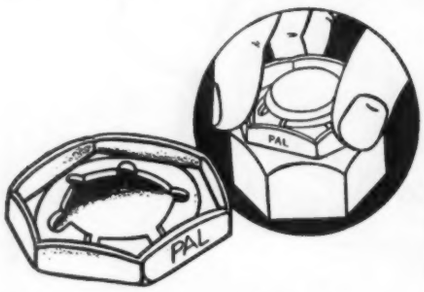
ACB and

ELIMINATE RE-TIGHTENING OF NUTS

On Steel Tower and Wood Pole Lines



Specify Palnuts on new lines
Add Palnuts to existing lines

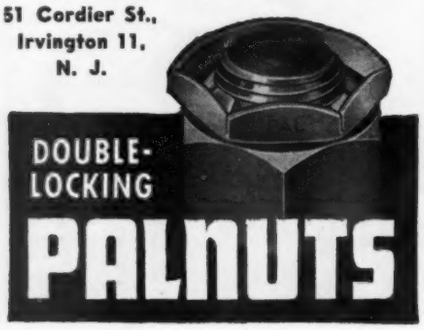


For over 10 years, Double Locking Palnuts have been keeping bolt-and-nut assemblies tight on steel towers, wood pole lines, cross arms and braces, insulator pins, clevises and clamps.

When applied on new installations, Palnuts save future check-ups and re-tightening. Maintenance crews checking old installations can add Palnuts without disturbing regular nut. Only 3 bolt threads space are required. Palnuts are very low in cost; may be removed and reused. They are available in a full range of sizes, in Hot Dipped Galvanized or other finishes and materials used by the Utility industry.

SEND details of your needs for samples. Write for Palnut Manual No. 1 and detailed folder on power line applications.

THE PALNUT COMPANY
51 Cordier St.,
Irvington 11,
N. J.



ing medium is necessary but generous watering has not proved harmful. Temperatures of from 72 to 75 deg. are ideal for many cuttings.

The tubes should be from 12 to 15 in. above the rooting medium. Although quicker rooting may be obtained under 16-hr. light periods with some species, continuous illumination is simple and generally satisfactory. When burned continuously or nearly so, the fluorescent lamps should last 5,000 to 6,000 hours.

A light rich in orange-red rays produces the most rapid and heavy rooting of cuttings. Either a 3,500-deg. white or a pink fluorescent tube is therefore preferable to a daylight tube, though reasonably good rootings may be expected with the latter. A light richer in the blue-violet rays is recommended for use in growing seedlings, as the light most favorable for cuttings produces a rapid but leggy, spindly growth of seedlings.

If the unit is in a basement or room in which the temperature fluctuates little and is suitable for the species of plants used, heating units are not needed. If a heating unit is needed under the rooting medium, it can be controlled by a chicken brooder thermostat or a soil-heating thermostat used for hotbeds.

Small sealed 75 to 100-watt heating units with bases fitting standard lamp sockets should be adequate in most cases. Old-fashioned carbon filament lamps or two tungsten filament bulbs connected in series also may be used. Special soil heating cables may be placed at the bottom of the rooting medium. Socket for the heater is mounted on a sidewall of the unit, with a metal shield to deflect water.

•

Utility Puts Family Appeal in Advertising

C. FRED WESTIN
Director of Advertising
New Jersey Power & Light Co., Dover, N. J.

The 1946 advertising program of the New Jersey Power & Light Co. is aimed specifically at telling customers that the power company is just as friendly as the family next door.

Four features are prominent in the campaign. Chief market for the company is residential rather than industrial or commercial, so the copy is directed to those customers. Since one feature is to point out that the elec-

TREAT POLES IN THE LINE

with

PERMATOX "A"

(5% Pentachlorphenol in petroleum solvents)

This is a *clean*, economical and effective preservative treatment that controls decay, shell-rot and termite attack.

Easy to apply to poles *in the line* by simply spraying or brushing on copious amounts of PERMATOX "A" throughout the exposed length of the poles, including the wooden cross-arms.

For new poles, the pressure treatment or soaking method affords adequate protection and assures prolonged pole life and reduced maintenance costs.

Old poles may be reclaimed and reused. Just crop off decayed tops and butts; shave away rotted areas from all surfaces; then spray, brush or dip to get good penetration of PERMATOX "A".

Furnished in Two Forms:—

DOWICIDE 7
Pentachlorphenol* crystals

PERMATOX "A"
5% Pentachlorphenol* in suitable petroleum solvents

*Manufactured by The Dow Chemical Company

Write for Bulletin—Dept. E

A. D. CHAPMAN & COMPANY, INC.

333 N. Michigan Ave., Dept. "E"
Chicago 1, Ill.

Atlanta · Chicago · New York · New Orleans · Los Angeles · Portland · Memphis · Houston

keeping skins and hides fresh

How Dowicides Keep Bacteria in Check

Destructive bacteria are effectively controlled by Dowicides in leather manufacturing, one of many industries which has reduced damage and losses through the use of these Dow germicides and fungicides.

Skins and hides in the soaking pits can be protected by the use of Dowicides, thus preventing excessive hair slippage and loss of hide substance.

Work done under a Dow-supported fellowship in the Leather Tanners' Research Council at Cincinnati several years ago proved that Dowicides are effective in preventing bacterial action.

Such a preventive step is especially important in warm weather or if skins or hides must soak for unusually long periods, such as over week-ends.

Dowicide pays off in any industry where bacteria, mold, fungi or termites attack products or materials. Let Dow show you how Dowicides can help you. Call any Dow sales office.

DOWICIDE

germicides and fungicides

Control termites mold and bacteria

DOWICIDES IN THE ELECTRICAL INDUSTRY

Effective preservative treatment of wood poles and cross arms is attainable with Dowicide 7 (Pentachlorphenol). Impregnation is achieved by heating the wood, followed by a cold bath in a pentachlorphenol solution. Dowicides also protect cotton braid covering and jute roving from dry rot and mold in overhead and underground cable installations.

THE DOW CHEMICAL COMPANY • MIDLAND, MICHIGAN

New York • Boston • Philadelphia • Washington • Cleveland • Detroit • Chicago • St. Louis
Houston • San Francisco • Los Angeles • Seattle

DOW

CHEMICALS INDISPENSABLE TO INDUSTRY AND AGRICULTURE

Features that challenge comparison in the PERMAGLAS Water Heater

1 *Permaglas* — the glass-fused-to-steel lining . . . sparkling blue, mirror-smooth, sanitary as a clean drinking glass.

2 Beauty of Design . . . gleaming white with decorative trim of polished stainless steel.

3 Neotone Enamel Finish . . . inside and outside of exterior shell protected by long-lasting, white enamel-baked-on-steel.

4 Rear-Vu Connections . . . no unsightly piping on top, no condensation drip on heater —a truly modern installation.

5 Dual Heating Units . . . with built-in heat trap and umbrella-type diffuser.

6 Monotraid Construction . . . assures greater strength and longer life.

7 Pyramid Base . . . sturdy and practical, with adjustable jacks to level heater on uneven floors and take weight off pipe connections.

SMITHway Water Heaters, lined with *Permaglas*, deliver hot water as sparkling clean as the source. No tank rust or corrosion. *Permaglas can't corrode!*

There's Only ONE SMITHway Permaglas GLASS-FUSED-TO-STEEL

A GREAT AID TO SALES

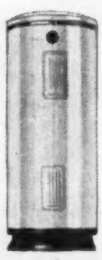
SMITHway *Permaglas* Water Heaters offer the most dramatic *new* sales story in the electrical appliance business . . .

The single-piece glass-lined tank. Sanitary as a clean drinking glass. Freedom from all tank rust and corrosion.

No "corrosion-dirt" in the bath . . . no "tank-spots" on clean clothes. Sparkling hot water as pure as the source.

GET THE PERMAGLAS STORY NOW!

Send today for complete details . . . get the booklet, "The Inside Story of *Permaglas*"—the new story that's packed with sales appeal.



HOT WATER BY wire

A.O. SMITH Corporation

NEW YORK 17 • PITTSBURGH 19 • CHICAGO 4 • TULSA 3 • HOUSTON 2 • DALLAS 1
LOS ANGELES 54 • SEATTLE 1 • INTERNATIONAL DIVISION: MILWAUKEE 1
In Canada: JOHN INGLIS CO., LIMITED

SMITHway Permaglas GLASS-FUSED-TO-STEEL ELECTRIC WATER HEATERS

tricity which serves the family at home is produced by people who are members of the large company family, the headline to be carried in all ads followed naturally. It is "Electricity is a Family Affair."

While maintaining its institutional flavor, illustrations and copy also include sales promotional material. By

Electricity is a Family Affair
"It's easy to keep your kitchen real bright
With modern appliances and lots of light."
Ever stop to think how closely electricity is associated with you and your family?
Or did you ever consider that electricity is really a family affair?
That's right. Electricity is working for you and your family — 24 hours a day — right inside your home.
Electricity is working now in your kitchen — cooking your family meals, keeping your food fresh inside your refrigerator, percolating your coffee and toasting your bread. Electric power is ready for you behind each switch—it's waiting to do any work you may desire.
And besides, the men and women who work for your Power and Light Company —those who see to it that you have dependable electricity at your beck and call — they are all part of one big family, too.
Electricity can do even more for your family in the days ahead. New electric appliances are on the way through your local dealers. They promise greater comforts than ever for you at home —happier days and nights for every member of your family.
Serving the Public for Over 58 Years
NEW JERSEY POWER & LIGHT COMPANY

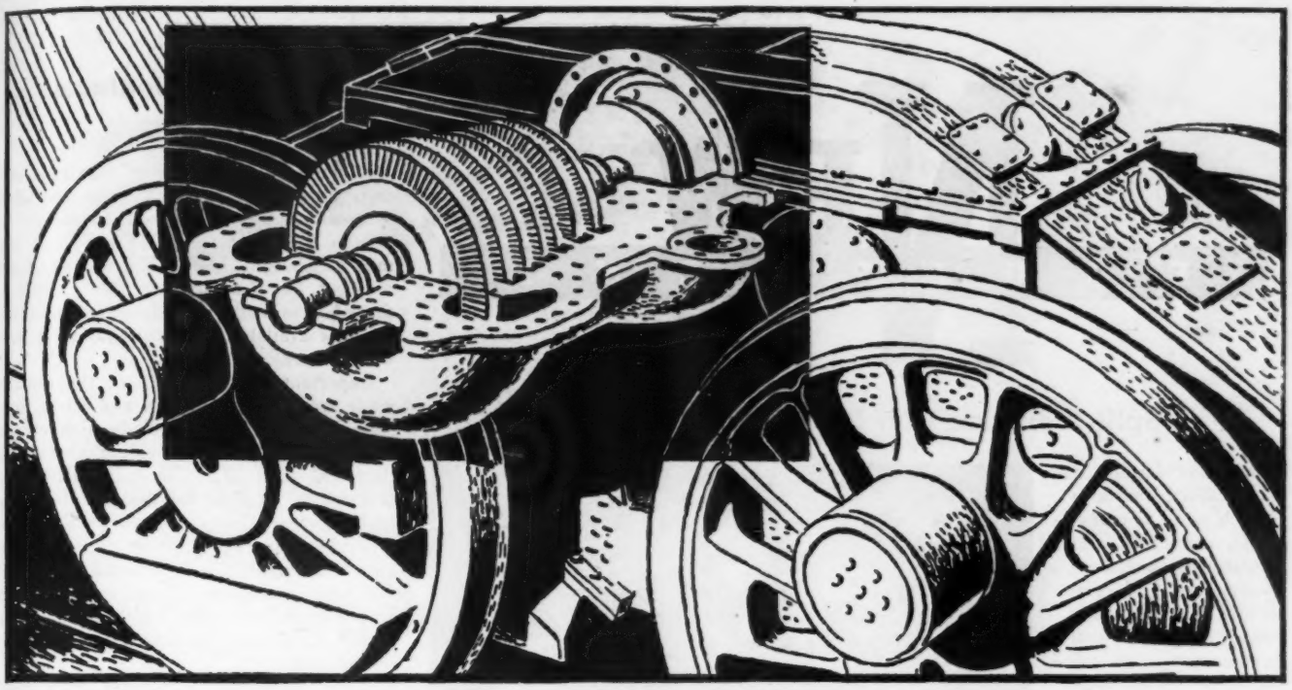
"I'M a family man, myself," says Reddy

showing what electric appliances can do to promote comfort and reduce work for every member of the family, the ads carry a definite sales message. Copy touches specifically on electrical cooking, refrigeration, and all other uses of domestic power.

"Electricity is working now in your kitchen," the copy states, "cooking your family meals, keeping your food fresh in your refrigerator, percolating your coffee and toasting your bread."

Third feature of the campaign is the promotion of the general value of electricity in the residential market. By showing the familiar electric symbol, "Reddy Kilowatt," at work inside the home with members of the family, the versatility of power as a servant is underlined. The series carries illustrations of every conceivable use to which electricity can be put by every member of the family.

The final, but important, feature of the program is directed to company employees as well as to the public. Because every employee likes to feel that he plays a vital role in the production of the company's power, the copy refers in every ad in the series to the fact that the family of company workers is responsible for electricity and all the comforts which it provides.



New Steam Turbine Locomotive

MAKING RAILROAD HISTORY

...with the aid of a SHELL LUBRICANT

TODAY a huge, new kind of locomotive is speeding over the countryside. This locomotive has no cylinders, pistons or driving rods. Its 6900 shaft horsepower comes from a steam turbine no larger than a refrigerator.

More than 1000 chromium steel blades are mounted on the rotor shaft inside the turbine housing. Steam, shot into the turbine through dozens of nozzles, strikes the first row of blades at 2000 mph, forcing the shaft to revolve. When the locomotive is traveling 100 mph the tips of the largest blades will be traveling nearly 700 mph.

Turbines such as these are subjected to terrific heat, and require a lubricating oil that can do three jobs: 1. Act as a coolant. 2. Lubricate thoroughly. 3. Protect against rust. It also must resist oxidation and sludging which might clog strainers and feed lines, slowing up the oil flow to the bearings. The reduction gearing, 97% efficient and involving high gear tooth pressures, would also be affected.

In Shell Turbo Oil the engineers found the lubricant that can do the job so essential in such high-speed, high-temperature operation. Shell Turbo Oil provides adequate anti-rust protection, and possesses high stability toward oxidation.

* * *

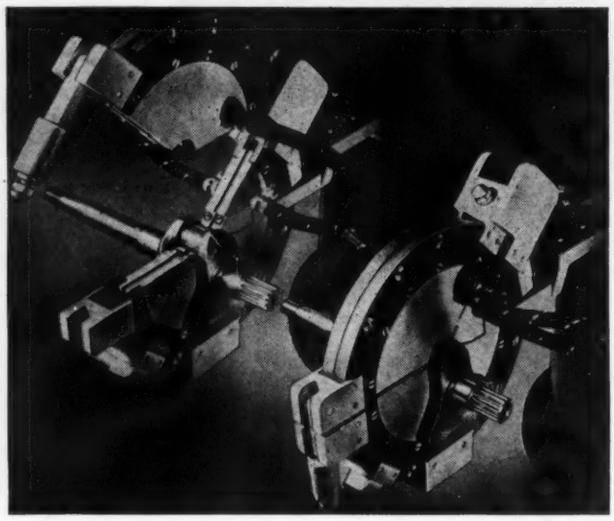
For more facts on Shell Turbo Oil get in touch with Shell Oil Company, Incorporated, 50 West 50th Street, New York 20, New York; or 100 Bush Street, San Francisco 6, California.

SHELL

SHELL TURBO OIL

NEW EQUIPMENT

Split Induction Coil Simplifies Operations



Induction hardening of localized surfaces of such parts as crankshafts, camshafts, and similar components, approximately 1-in. dia. or less, has been simplified by a split coil development, according to a report from the Induction Heating Corp., 389 Lafayette St., New York 3, N. Y.

The new coil consists of two or more turns, made up of machined copper plates, which are split and hinged in such a manner as to allow the coil to be opened, the work inserted in place, and the coil closed and clamped, automatically making contact between the segmental sections to provide a continuous path for current flow. The segments of the coil are held in relationship to each other by an insulating retainer ring which runs around the outside of the coil proper and forms a closed passage between the coil turns.

When hardening operations are to be performed, this chamber can be utilized to carry the quenching medium to the heated metal without removing the work from the coil. This also eliminates the time delay between the end of the heating process and the start of the quench. Since both the coil segments and supporting leads are independently water-cooled, the coil may be used without internal quenching, thus permitting continuous operation for all applications.

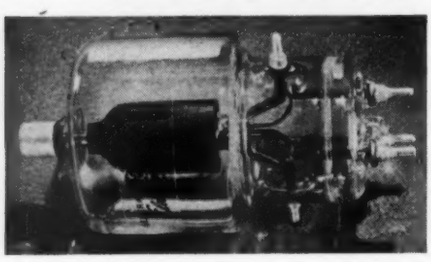
The split coil is reported to have been successfully used on such applications as (1) crankshafts, where each journal is hardened individually; (2) camshafts, where the shaft is progressed and each cam is placed successively in the coil; (3) shafts having large sections or flanges at their ends and (4) brazing and annealing of sections which require split-type coils.

Power concentrations up to 20 kw. per sq. in. on ½-in. diameter shafts are said to have been attained and result in hardened cases of 0.020-in. thicknesses when used with equipment having an output frequency of 375,000 cycles.

• • •

Transmitting Tube Eliminates Base

A new transmitting tube, Type GL-592, has been announced by the tube division of the General Electric Co.'s electronics department, Syracuse, N. Y. It has been designed for use in amateur radio and industrial applications which require power in higher frequency ranges.



Maximum ratings of the GL-592 are reported to apply up to 110 mc.

The new tube for transmission service has a maximum d.c. plate voltage rating of 3,500 volts and a maximum plate dissipation rating of 200 watts under class C r.f. amplifier and oscillator conditions. Under these conditions the maximum plate input rating is 600 watts.

Fernico-seal design of the tube makes possible elimination of bases, soldered terminals and permits a reduction of leads length. The design is said to provide increased structural strength.

New Series of Contacts Made by Gibson

A new series of "Gibsiloy" electrical contacts made from silver tungsten and silver tungsten carbide has been announced by Gibson Electric Co., 8351 Frankstown Avenue, Pittsburgh 21, Pa. Recently developed to meet the demands for war production, the contacts made from these new materials are now available for incorporation in postwar designs.

Important characteristics of the contacts made from silver tungsten and silver tungsten carbide reported include high current carrying capacity, non-welding characteristics, and long life. These properties are reported to enable the designer to utilize high current densities with resultant increased efficiency in performance. On an air circuit breaker, it is reported that a contact with less than 1/6 sq. in. of contact area repeatedly breaks 15,000-amp. circuits at 600 v., without sticking, welding, or excessive wear.

Made by a special process from metal powders, these electrical contacts comprise a range of combinations in the silver tungsten series from 10 percent to 80 percent tungsten, and in the silver tungsten carbide series from 20 percent to 80 percent tungsten carbide, with hardnesses from 80 to 100 Rockwell B.

• •

Mobile Fire Extinguisher Contains 750 Lb. of CO_2

A new model wheeled portable fire extinguishing unit, called the Transitank, with a capacity of 750 lb. of liquid carbon dioxide, is now being manufactured by Cardox Corporation, 307 North Michigan Ave., Chicago 1, Ill. One of the features reported is the high application rate of 300 lb. of carbon dioxide per minute from a single nozzle. Shielded behind the screen afforded by this discharge, one operator is reported able to handle a relatively large fire.

The dioxide is stored in a refrigerated and insulated pressure vessel at a constant temperature of approximately 0 deg. F. and 300 psi. At this temperature, the liquid carbon dioxide is reported to yield 47 percent CO_2 "snow" (finely divided particles of dry ice) when released. This yield of

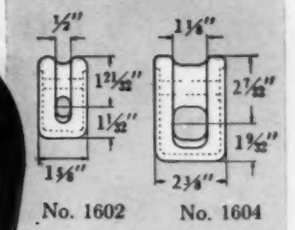
30 years of Proof!

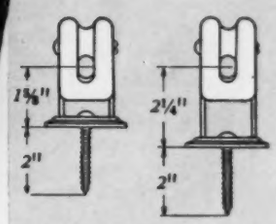
HUBBARD No. 190 WIREHOLDER

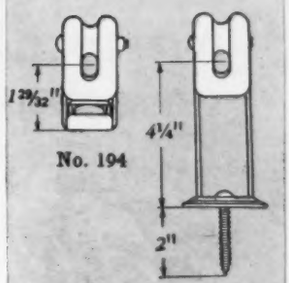
For more than 100 years, Hubbard and Company has enjoyed the privilege of serving industry with its greatly diversified products of the durable goods class.

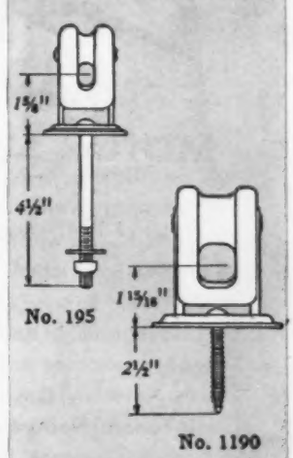
During the latter half of this century of service, the most notable group of materials has been a complete line of Pole Line Hardware, and for more than thirty years, Hubbard No. 190 Wireholders have been produced in quantities reaching well into the millions.

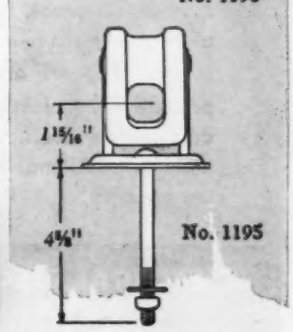
This old, reliable design with its variations shown here, is the favorite of many engineers and linemen from coast to coast. They know, that in thirty years of service, the Hubbard No. 190 has encountered every hazard to which a wireholder may be exposed. They know it has a slender pointed, full threaded screw for easy starting and maximum holding power in sheeting or solid wood. They know that its strength is much greater than that of the average service wire. They have discovered that this strength is due to the fact that the porcelain insulator is in compression with metal supports, not in tension, which is the weakest state of porcelain. They have thirty years proof that the Hubbard No. 190 has what they want in a wireholder.









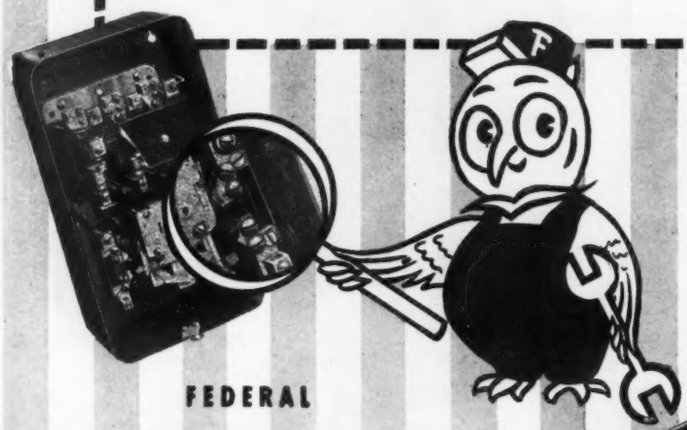


Stock No.	DIMENSIONS—INCHES				Approximate Shipping Wt. Lbs., 100 Pcs.
	Insulator	Size of Screw, Bolt or Tap	Extension Base to Ctr. of Wire Hole	Size of Wire Hole	
190	1602	No. 22 x 2 Wood Screw	1-5/8	9/16 x 3/4	105
190-A	1602	No. 22 x 2 Wood Screw	2-1/4	9/16 x 3/4	115
190-R	1602	No. 22 x 2 Wood Screw	4-1/4	9/16 x 3/4	150
194	1602	5/8 Tap	1-29/32	9/16 x 3/4	95
195	1602	3/8 x 4-1/2 Carriage Bolt	1-5/8	9/16 x 3/4	140
1190	1604	No. 24 x 2-1/2 Wood Screw	1-15/16	1-1/8 x 1-1/8	228
1195	1604	3/8 x 4-5/8 Carriage Bolt	1-15/16	1-1/8 x 1-1/8	240

HUBBARD and COMPANY

PITTSBURGH • CHICAGO • OAKLAND, CALIFORNIA

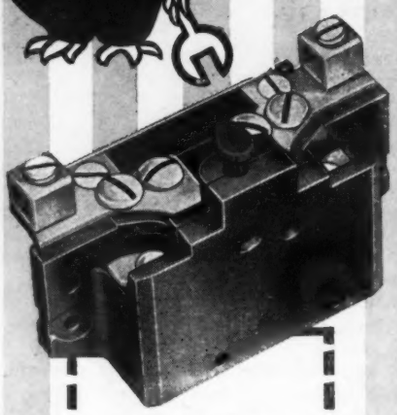
FOR FOOL-PROOF SAFETY EVERY TIME
IN CUTTING MOTORS FROM THE LINE,
THIS FEDERAL RELAY DOES THE TRICK
WITH THOSE WHO KNOW—
IT'S BOUND TO CLICK!



FEDERAL
OVERLOAD RELAYS
STANDARD EQUIPMENT ON

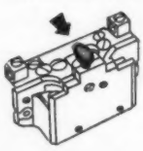
Federal NOARK
MAGNETIC
MOTOR STARTERS

Wherever overload protection is needed . . . whether on new or existing installations . . . Federal's Overload Relays will provide the "plus-margin" of dependability generally associated with Federal products. Naturally, these relays are built into Federal Noark Magnetic Starters . . . but remember, too, that they're available for your special applications. Federal Overload Relays provide conveniently located load and control circuit terminals, often making additional terminal blocks unnecessary.



DESIGNED FOR AUTOMATIC OR MANUAL RESET

Diagram shown above illustrates Plunger (arrow) set for "automatic" reset.



Plunger is set for "hand" reset in above diagram.

FEDERAL ELECTRIC PRODUCTS COMPANY, INC.
EXECUTIVE OFFICES: 50 PARIS ST., NEWARK 5, N. J. · PLANTS: HARTFORD, CONN. · NEWARK, N. J.

CO_2 snow is said to provide increased cooling effect when projected by means of a patented "Snow-Separation" nozzle. It is stated that the snow can be directed into the heart of the fire through relatively great distances in the presence of strong air currents. As controlled and applied, the carbon dioxide is reported to have uniform discharge and extinguishing characteristics.

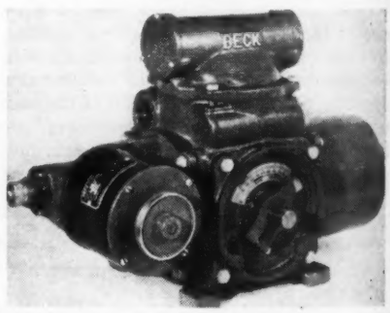
The Transitank is manufactured in three types: an all-purpose, indoor-outdoor unit equipped with pneumatic tires, which may be either hand-propelled or attached by its trailer hitch to any industrial power truck; a steel caster unit designed for extreme maneuverability and close clearances indoors and a motorized unit for industries and operations requiring a unit capable of traveling comparatively great distances. All are equipped with nozzle, 50 ft. of hose and a squeeze valve which controls the carbon dioxide discharge. Refilling is accomplished by means of Cardox transport trucks, with the liquid carbon dioxide pumped into the unit directly from the truck.

•

Mechanism Developed For Control Systems

The "Beck Mechanism" is an automatic control actuator which operates valves, rheostats, auto-transformers and similar devices, developed several years ago by Harold Beck Co., 3644 North Second St., Philadelphia 40, Pa., but only recently announced to the trade. It is reported to make close control possible under rapidly changing loads, to hold temperature or other conditions to a control point, and to permit operation at maximum sensitivity.

It is based on three control actions. C-1 is proportional to and opposes any change of the controlled condition within the throttling range. C-2 and C-3 are the automatic reset or droop corrections and are said to



eliminate hunting and off-point "settling down." The C-2 is the major part of the correction. It is proportional to the C-1 action, and is said to be introduced to the system as fast as it can be absorbed. The C-3 action consists of an impulse that is periodically introduced when the system is off the control point, to move the regulating device in the proper direction and thereby restore the system to the control point.

This is a timed action and is proportional to the magnitude of the deviation. C-3 prevents the system from staying off the control point due to some unusual combination of demand change and control action.

The units are handling special control problems involving sequence action interlocks, directional contacts, maintaining con-

The Lines are down... BUT NOT FOR LONG!

Motorola F-M equipment in a fixed transmitting station.

Motorola Mobile Unit mounted on a line patrol car.

Motorola 2-WAY F-M RADIOTELEPHONE HELPS MAINTAIN CALIFORNIA POWER SUPPLY

Sandstorms, cloudbursts and blizzards are no surprises for line-patrolmen of the California Electric Power Company. Here, in the Sierra Nevadas, communication is an important factor in the power-line maintenance that is a 24-hour job.

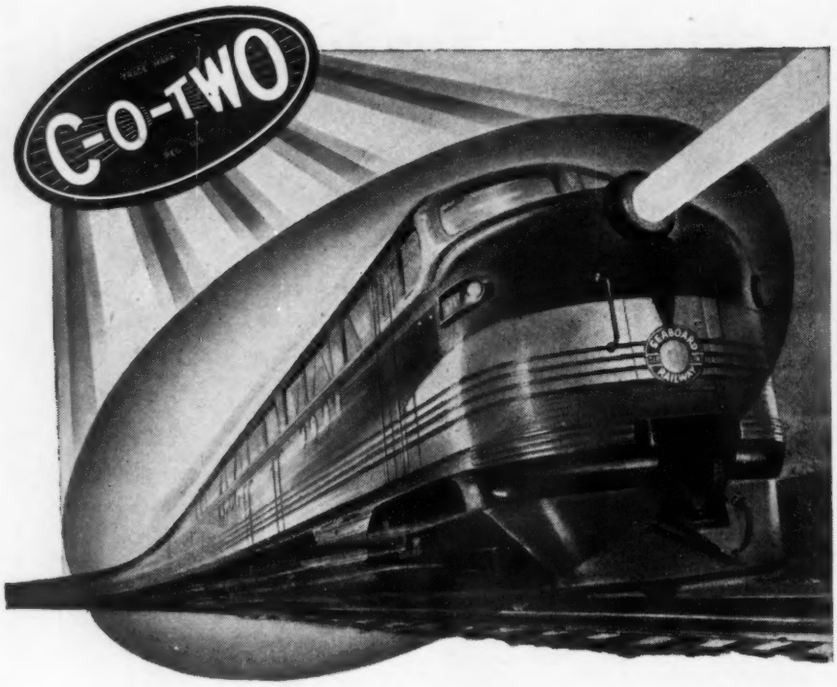
Two-way F-M radiotelephone was seen as the answer to this communication problem, and Motorola (makers of the battle-tough "Handie Talkie") was the obvious choice for equipment that could be depended on under all conditions.

More and more, industry is turning to Motorola for radio-telephone communications. One of our field engineers will be happy to show you how the efficiency of *your* operation can be increased through the use of radio.

FREE! Write for detailed Motorola Radiotelephone Directory covering more than 1000 Motorola 2- and 3-way F-M systems in United States, Canal Zone and Hawaii.

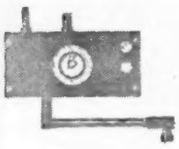
GALVIN MFG. CORPORATION • CHICAGO 51
COMMUNICATIONS AND ELECTRONICS DIVISION

F-M & A-M HOME RADIO • AUTO RADIO • PHONOGRAPHS • TELEVISION
POLICE RADIO • AIRCRAFT RADIO • RADAR • MILITARY RADIO



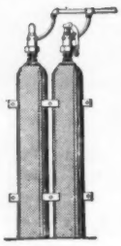
Modern Seaboard Diesel Engines . . . Protected by Modern C-O-Two

Modern fire protection on high speed diesel locomotives is not only imperative, it's good business. Past experience has shown that should a fire occur in a diesel locomotive, travelling at high speed — it can cause serious damage and high loss to equipment. Due to the high speed, wind conditions are greatly increased, thus the fire spreads quickly, destroying valuable equipment. Adequate protection — quick detection and fast extinguishment of diesel engine fires is a must.



Smoke Detecting Unit

C-O-TWO engineers solved this problem to the satisfaction of the Seaboard Railway. Fires over the engines are detected by a fire alarm system operated by thermostatic control. To quickly extinguish fires in these areas two tanks of fast acting, non-damaging, non-conducting carbon dioxide are provided along with two carbon dioxide hose reel systems. Fires in parts of the engine-trucks, over fuel tanks and battery boxes are detected by the ever-alert C-O-TWO Smoke Detector. For these hazards, C-O-TWO equipment provides pressure for foam and water type extinguishers supplied by our affiliate, Pyrene Manufacturing Company.



Modern fire protection for diesel engines — whether for transportation or stationary jobs is another C-O-TWO development. Write today for full information.

C-O-Two
Fire Equipment Company
NEWARK 1 • NEW JERSEY

Sales and Service in the Principal Cities of United States and Canada

AFFILIATED WITH PYRENE MANUFACTURING COMPANY

tacts, and other switching arrangements. They are also used for control of gas-fired or electric furnaces, automatic reversal of regenerating furnaces, safety circuits for gas purging and in electrical testing apparatus.

Each mechanism is driven by a slow-speed, high torque, non-coasting control motor. A non-mechanical magnetic brake is said to assure reproduction of minimum turn down and non-hunting control action without sacrificing sensitivity of the control system. It is reported that the armature can be stalled without damage to the mechanism and the stalled motor will not overheat.

•

Wide Beam Flashlight Developed for Night Work

Three-cell, plastic, safety flashlight—known as Model No. 17-S—with a wide Honeycomb lens or with the regular type lens is being announced by the Justrite Mfg. Co., 2061 North Southport Ave., Chicago, Ill. Designed as a working light for industry, the special lens is said to provide a circular beam three times as large as the usual spot.

It is reported that at a distance of 8 ft. the light covers an area about 3 ft. in diameter. Dark rings and spots are said to be eliminated.

The flashlight uses three standard flashlight cells approved for safety by the U. S. Bureau of Mines and the Underwriters' Laboratories (class 1, Group D). It is stated that the design—with belt clip on side and carrying ring on bottom—permits ease in handling. The light is $5\frac{3}{4}$ in. high; $2\frac{3}{4}$ in. wide. Reflector is $2\frac{1}{2}$ in. in diameter. Case is made of plastic and is molded in one piece. Reflector and lens ring are metal.

•

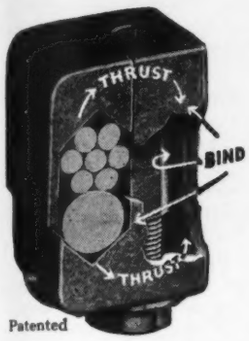
Oil Purifier Built for Preventive Use

A mobile insulating oil purifier that can be moved to equipment in the plant or in the field on a regular schedule, or used for preventive purification without interrupting continuous operation of the equipment, is being announced by Honan-Crane Corp., 734 Wabash Ave., Lebanon, Ind.

The unit consists of hand truck, hoist, purifier, pump, motor, filter press, drying

FARGO One-Piece Connectors

Permanently Vibration-Proof...



Patented

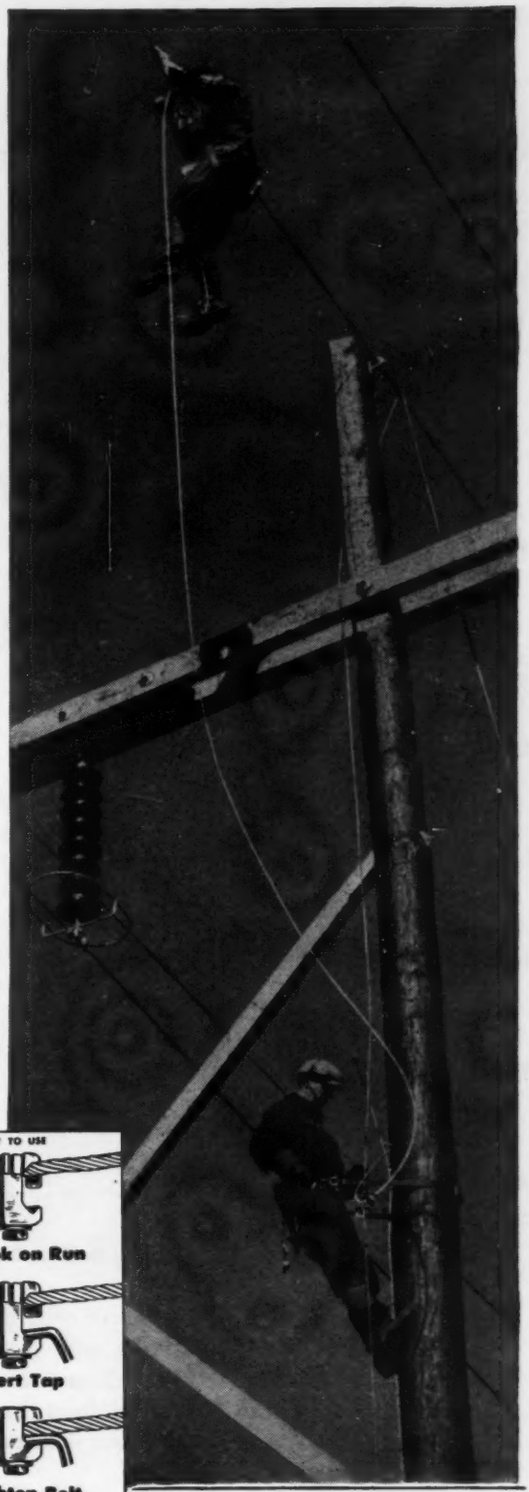
because they are built like a vise... grip like a vise

High pressure at wire contact point develops tremendous *vibration-proof bind* from inside thrust against the vise-type sleeve of the body. The bolt, forged and rolled for extra strength, turns easily; develops 10 lbs. or more compression between conductors for every inch-pound of wrench pressure.

Dependability and high salvage value

The sturdy mechanical construction of Fargo Connectors, plus the carefully selected copper alloys used in body and bolt, insure high salvage value as well as dependability. They can be used over and over again.

And it's easy to clean used Fargo Connectors in order to insure unimpaired efficiency. Because all parts of the Fargo Connector are precisely made and no distortion of the body or bolt occurs in use, all parts are interchangeable. Thus any number of Fargo Connectors of the same size can be taken apart, thrown into an oxide removal bath and reassembled without thought to which part comes from which connector.



Easy to use

Because of its one-piece construction the Fargo Connector is always threaded—no time is lost starting a nut—there is no chance of cross threading—no loose parts to lose.

The connectors are made with three sizes of bolt heads—any adjustable wrench will fit 12 sizes of Fargo Connectors handling wires from No. 8 Solid to 1000M C.M.

Full Fargo line of Vise-type Connectors, Automatic Line Splices, Hot Line Taps and Sticks, Multiple Taps, Dead Ends, Compression Cone Connectors, Sleeves, Ground Clamps, and other Electrical Specialties are distributed by

LINE MATERIAL COMPANY · MILWAUKEE · WIS.

Representatives in principal cities

FARGO MFG. COMPANY ESTABLISHED 1914 **POUGHKEEPSIE, N.Y.**

as the Sea itself!

BRASS

BRONZES

COPPER

MONEL

STAINLESS

Scientists have made many guesses as to how long the seas of the world will last. Some think they will last forever. There is little guessing, however, as to how long Harper non-ferrous and stainless fastenings will last . . they will far outlast the assemblies in which they are used. Even in corrosive chemicals they will outlast common steel because . Harper Everlasting Fastenings are made exclusively of Brass, Copper, Naval Bronze, Silicon Bronze, Monel Metal or Stainless Steel and will not rust or corrode.

everlasting fastenings

A stock of over 5000 different types and sizes of bolts, screws, nuts, washers and other standard items assures fast delivery of your orders. Specials are engineered and produced from raw materials on hand for speedy fabrication. Ask for our 120-page 4-color catalog for easy reference.

THE H. M. HARPER COMPANY
2611 FLETCHER STREET • CHICAGO 18, ILLINOIS

Branch Offices
NEW YORK CITY • PHILADELPHIA
LOS ANGELES • MILWAUKEE
CINCINNATI • HOUSTON
Representatives in principal cities

HARPER
Chicago

oven and flexible hose. Fuller's earth, the purifying medium, the report states, will remove solid, tarry and resinous contamination as well as organic acidity and oxidized material. The blotter press dehydrates and removes the moisture.

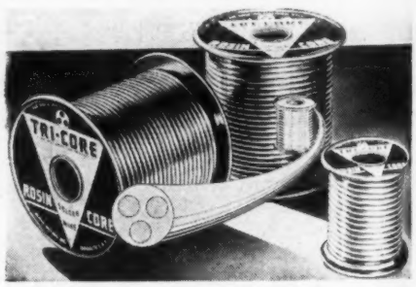
"Type R" mobile insulating oil purifiers are designed for use on transformers, oil circuit breakers, induction voltage feeder regulators, electric lightning arrestors, industrial control devices, static condensers, oil fuses, cutouts, lead covered power transmission cables, etc. Best results, it is claimed, are obtained from following a regular schedule or preventive purification, maintaining the oil in good operating condition at all times.

Unit is made in three sizes, with capacities of 100, 200 and 300 gph. The piping is so arranged that by means of two 3-way valves the filter press can be bypassed, using the Purifier alone; the Purifier can be bypassed, using the blotter press alone; and both of these units can be by-passed, and the pump used only as a transfer pump. The smaller units can be hauled from one station to another by means of a ½-ton pick-up truck.

•

3-Core Solder Announced By Alpha Metals

Tri-Core, a solder with three independently filled cores of rosin flux, is a development of Alpha Metals, Inc., 369 Hudson Ave., Brooklyn 1, N. Y. The report states that with three cores the occurrence of "dry" sections in more than one core at a given point is unlikely.



The walls are reported as thinner than single-core types, which is said to allow faster heat penetration and results in the flux reaching the work ahead of the molten solder. The solder is reported as available in all alloys, all flux percentages and all gages.

•

Mild Steel Electrode Prevents Cracking

A new all-position mild steel electrode, called Airco No. 312, has been announced by Air Reduction Sales Company, 60 East 42nd St., New York 17, N. Y. It was designed primarily to prevent underbead cracking in the welding of hardenable steels. The report states that laboratory tests and field applications indicate the electrode is satisfactory for welding: low alloy, high tensile steels, particularly in heavy sections where preheat must be used with conventional type electrodes to minimize cracking; free machining steels which normally run quite high in sulphur; and cold-rolled steels

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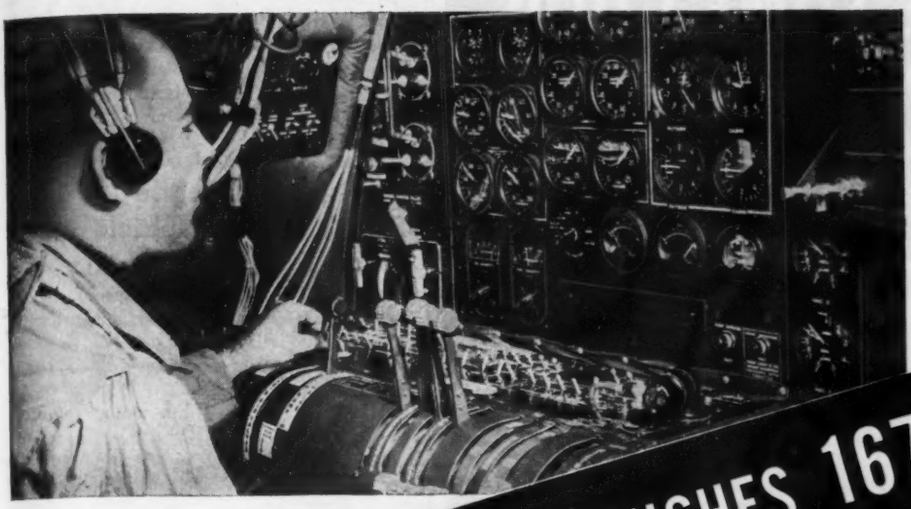

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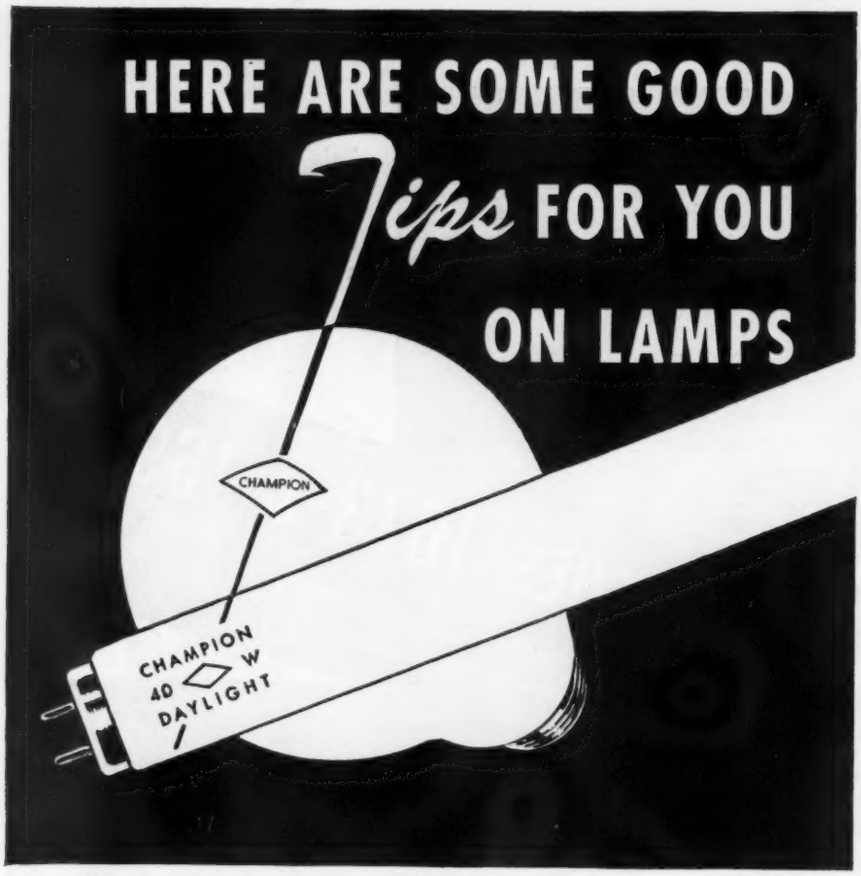

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where excessive porosity is normally encountered with conventional type mild steel electrodes.

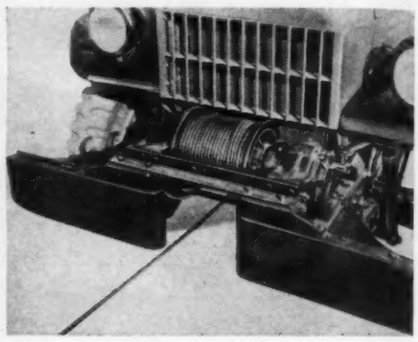
For material to be vitreous-enameled after welding, the electrode is said to make possible production of satisfactory enameled surfaces without any preheat treatment prior to the enameling operation.

•

Utility Truck Made From Military Vehicle

"Power-Wagon" is a general purpose truck which was developed specifically for public utilities and kindred industries. It is a recent civilian adaptation of the four-wheel drive military vehicle which Dodge made during the war.

The truck has a 94-hp. motor (at 3,200



rpm.) and is reported as capable of handling 1½ tons in off-the-road service. Chrysler Corp., Detroit, Mich., reports that a transmission power take-off is available with front and rear drive shafts. Through the front shaft, this take-off drives a 7,500-lb. winch mounted as shown in the accompanying illustration. Through the tail shaft drive, which is located in the center of the rear-cross member, a means of operating pulley belts is provided.

It has a 4-speed transmission and a 2-speed transfer case, which provides eight speeds forward and two reverse. The steel express body is 8 ft. long, 4½ ft. wide and 22¼ in. high. Gross weight rating with 9.00 tires is 8,700 lb. Road clearance is reported as 10$\frac{23}{32}$ in. and wheelbase is given as 126 in.

•

Two Electrodes For Hard Facing Applications

One new and one improved shielded arc electrodes, each of the type designed for specific hard-facing applications, have been announced by The Lincoln Electric Co., Cleveland, Ohio.

"Abrasoweld AC," designated as a hard-facing shielded arc electrode, is designed for building up straight carbon steel, low alloy steel or high manganese steel with a self-hardening deposit to resist abrasion, battering and impact. Although specially designed for operation on alternating current, it may be used for both the industrial type and small, mass-market type welding machines and direct current.

Properties of weld metal of this new electrode are of the self-hardening type alloy which is semi-austenitic and abrasion resisting, and it is reported to harden rapidly

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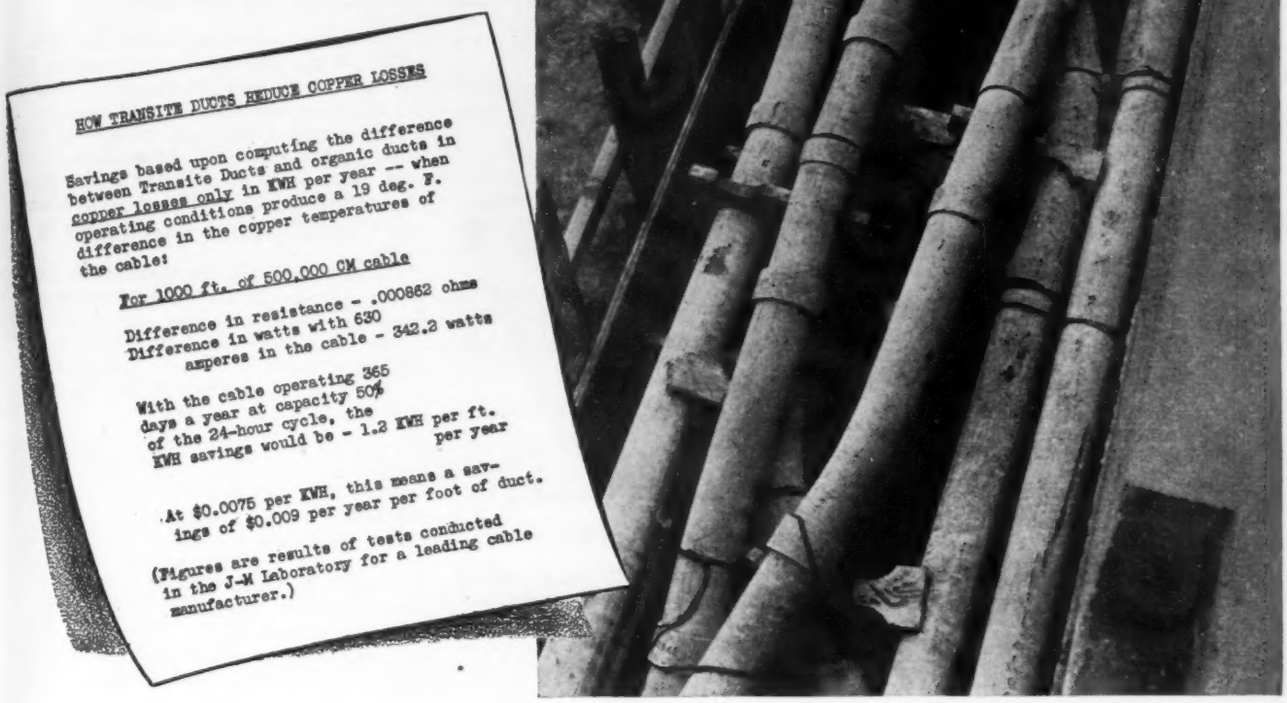
HOW TRANSITE DUCTS REDUCE COPPER LOSSES
Savings based upon computing the difference between Transite Ducts and organic ducts in copper losses only in KWH per year -- when operating conditions produce a 19 deg. F. difference in the copper temperatures of the cable:
For 1000 ft. of 500,000 CM cable
Difference in resistance - .000862 ohms
Difference in watts with 630 amperes in the cable - 342.2 watts
With the cable operating 365 days a year at capacity 50% of the 24-hour cycle, the KWH savings would be - 1.2 KWH per ft. per year
At $0.0075 per KWH, this means a savings of $0.009 per year per foot of duct.
(Figures are results of tests conducted in the J-M Laboratory for a leading cable manufacturer.)

High cable temperatures increase cable costs all along the power line!

In Transite Ducts, where cables stay cooler —*reduced copper losses alone* represent a savings of 1.2 KWH per foot per year.

This test case is one of many conducted by Johns-Manville Research Engineers in co-operation with a leading cable manufacturer, proving that Transite Ducts keep cables cooler —dissipate I^2R losses 13% faster than other ductways tested. Copper losses are reduced, insulation life is prolonged . . . and current carrying capacity increases as much as 15%.

Made of asbestos and cement, Johns-Manville Transite Ducts are strong, immune to rust and rot. They are incombustible and unaffected by electrolysis or galvanic action. A permanently smooth bore makes possible long cable pulls and easy replacements. Long, lightweight lengths can be quickly and economically installed. In addition, a full line of fittings simplifies even the most complicated installations.

For full information write for Data Book DS-410; Johns-Manville, Box 290, New York 16, N. Y.

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This SturdE Multipoint Cant Hook is being specified by more and more utilities because it is a real time and money saver. Manufactured by The American Fork and Hoe Company, Cleveland, Ohio, Makers of True Temper Products.

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under conditions of impact and abrasion. Moderate peening is reported to increase hardness as deposited from 20-40 Rockwell C to over 50 Rockwell C. The weld metal is said to maintain its toughness and to develop its maximum hardness only at the surface where it is cold worked, and, as a result, beneath the surface remains a cushion of softer metal which is stated to eliminate checking and flaking. This new electrode is available in ⅛-in., $\frac{5}{32}$-in. and $\frac{3}{16}$-in. sizes and is furnished in 14-in. lengths.

"Manganweld A," suspended for the duration, has been improved and is now manufactured specially for reclaiming worn austenitic manganese steel parts containing 11 percent to 14 percent manganese. It is reported as suited for use with direct current machines, and may be used with both the industrial type alternating current, and small, mass market type welding machine.

Generally recommended for flat work only, it is said to produce a flat bead and to melt uniformly with minimum spatter. The weld deposit is reported as air-toughening, to remain in austenitic state and to retain carbides in solution. The deposited metal has a resistance to abrasion and impact which is stated to equal heat-treated cast maganese steel. Weld metal, as deposited, has a reported hardness of 5 to 10 Rockwell C and, cold worked, a hardness of 45 to 50 Rockwell C. It is furnished in $\frac{5}{32}$-in., $\frac{3}{16}$-in. and ¼-in. sizes and 14-in. lengths.

•

Clothes Dryer "Specs." Revealed by Bendix

Specifications of the company's new automatic home dryer were made public recently by L. F. Worth, manager of dryer sales, Bendix Home Appliances, Inc., South Bend 24, Ind.

Heat controlled by a thermostat is said to remove the moisture from 18 lb. of wet clothes, making them bone dry in 45 min. An automatic regulator is provided to control the degree of water extraction between damp dry and bone dry.

The company reports that there will be two models, identical in appearance. One will be gas heated and the other electrically heated. The two models share in the following specifications:

Capacity, 18 lb. of wet clothes, bone dry in 45 min.; operating speed, 50 rpm.; motor 1/6 hp., 110 volt a.c.; dimensions, 36 in. high, 31 in. wide, 25 in. deep; weight, 250 lb.; finish, white, hard-baked enamel.

The electric model will operate on 220 volts. Other electrical characteristics: 20 amp., 4,800 watts. It is stated that venting of moisture usually will not be necessary unless there is more than one dryer in a room.

The gas heater operates on 22,000 B.t.u. of gas. At the back of the dryer there is provision for a 3-in. pipe connection to exhaust gas fumes outdoors where necessary. The center of the hole is located 33½ in. from the bottom and 3½ in. from the right side.

•

Mechanical Arm Utilized on New Truck Design

A power truck equipped with a horizontal, non-swivel type boom, moving vertically with its shoulder riding in the upright columns of the truck, is among the recent developments of Elwell-Parker Electric Co., Cleveland, Ohio.

This mechanism was developed for moving heavy and bulky objects to which a hook, chain, rope or cable may be attached. The boom functions somewhat as a boom on a crane.

Suspended by a short length of chain, an object can be swung around for passage through aisles or doors, or for positioning for finishing operations, or shipping. Illustration shows the truck used in transporting rough castings in a machine tool builder's plant.

The truck has a capacity of 3,000 lb. The boom is available in lengths of 72, 66 and 60 in., from face of uprights. At lowest point the hook is 22 in. above floor level; at highest, 8 ft. The boom may be made interchangeable with a platform and thereby increase the variety of loads which may be transported.

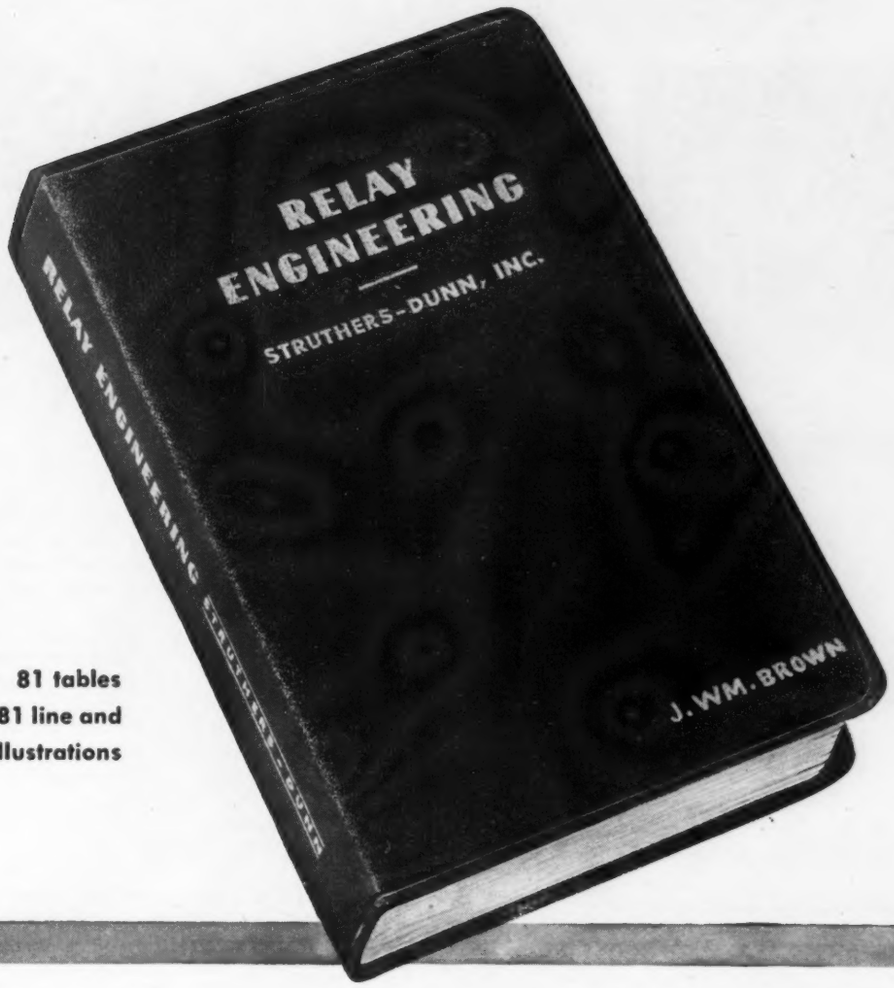
•

Hydrogen Thyratrons For Industrial Service

Two new types of hydrogen thyratrons suitable for a wide range of applications, including the timing of high speed welding equipments, electronic heating for glass and plastic products, electroplating, high-speed photography, diathermy and other electrosurgical equipments, marine and aircraft radar, and pulse communication systems, have been announced by Sylvania Electric Products Inc., 500 5th Ave., New York 18, N. Y.

Other industrial and communication applications include switching in capacitor discharge welding circuits, shock excitation of tuned circuits, piezoelectric crystal excitation, use in induction heating circuits to replace spark gap heaters, pulse time modulation circuits in which signals are produced by modulating the pulse repetition rate, and servomechanisms where relatively high a.c. supply frequencies are used.

Features of the new hydrogen thyratrons reported include low deionization time, rapid switching rates, high peak currents,



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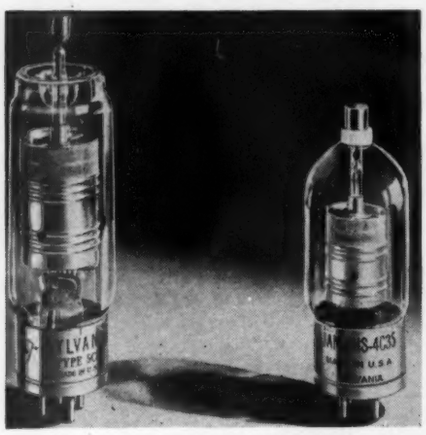


high plate voltages, moderate trigger requirements, ability to operate at zero bias, operation over wide ambient temperature range, low tube voltage drop, and operation in any position.

Typical ratings and operafing conditions for these hydrogen thyratrons are:

Tube Characteristic	Type 4C35	Type 5C22
Heater, volts	6.3 + 5 percent − 10 percent	6.3 ± 7.5
Heater, amperes @ 6.3 v.	5.5 to 6.7	9.6 to 11.6
Peak anode, kv.	8.0	16.0
Peak anode, amperes	90	325
Average anode, ma., d.c.	100	200
Tube base	RMA 4310	RMA 4310
Bulb size	T-20	T-20
Over-all length, inches	7	10

Motor Operated Relay For Time Delay Operations

A new relay of synchronous motor-operated type to provide for a predetermined time delay of from one to ten minutes between actuation of relay coil and operation of relay contacts is announced by Price Electric Corp., Frederick, Md. When relay coil is energized, the synchronous motor that drives the mechanism immediately functions and continues to run until delay period elapses, whereupon the motor is disconnected.

Contacts, however, remain in the operated position until operating coil is deenergized, whereupon the mechanism will reset and be ready for the next cycle of operation. Standard relay is equipped with two snap action switch units, one being used to control the motor, and the other providing up to a single pole double throw contact combination for customer's use.

Available in front connected type, or with 6-32 threaded studs on under side for back connection use, it is reported usable in filament preheating, or other applications utilizing a specified delay period. Standard relay operates on 115 volts, 60 cycles, a.c. only. Requirement of 7 volt-amp. during delayed action period, and on 3.5 volt-amp. thereafter until energizing current is withdrawn from operating coil. Motor does not run continuously. Contacts are rated up to 10 amp. at 115 volts, a.c., non-inductive load. Relay size including cover is $3\frac{9}{16}$ in. long, $3\frac{13}{16}$ in. wide, $2\frac{3}{4}$ in. high.

Range Load Increased Without Upping Demand

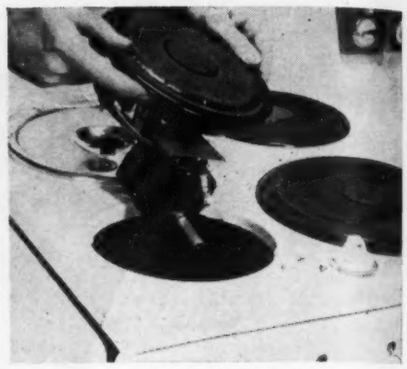
Increasing the connected load of an electric range without a comparable increase in the maximum demand on the secondary system was recently achieved by engineers of Proctor Electric Co., Philadelphia, Pa. The technique of limiting the demand utilizes a new switch called a "supercharger."

This switch momentarily parallels two 118-volt coils in the surface unit on 236 volts and thereby quadruples the unit's wattage. The time necessary to bring the unit up to "cherry-red" heat is approximately 35 seconds, at which time the circuit is opened by a thermostatic switch on the unit and, as additional heat is needed to continue the cooking operation, the thermostat automatically closes the circuit on the desired wattage as preset on the switch knob. At the same time, while in the supercharge position, the switch opens one leg of the range bus to the oven and certain other units, which prevents increasing the maximum demand beyond the connected wattage capacity of the range.

The accompanying diagram illustrates the control of the unit. The switch is shown in the "off" position. The unit is cut into the circuit by depressing a switch knob and turning in a clockwise direction. As it leaves the "off" position and cuts the unit into the circuit, the thermostatic pan control device is cut into the circuit and thereby controls the temperature of the vessel resting on the unit.

By the same operation, blade R closes on to contact 5, S onto 9, T draws away from 3 and opens the neutral, U closes to 11 and V to 12. This circuit stays closed about 35 seconds.

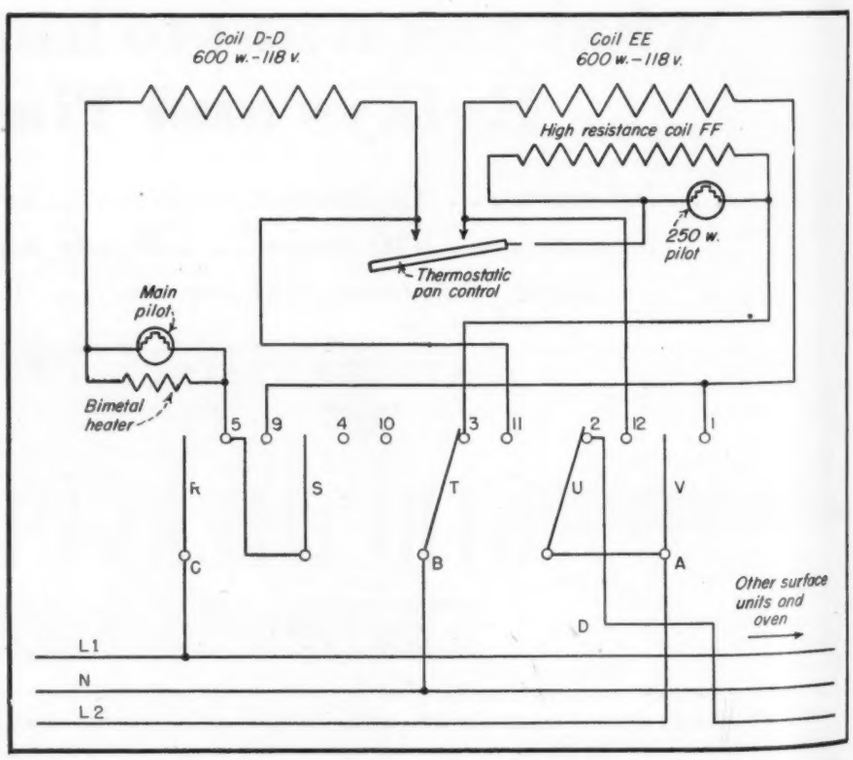
After the unit has attained the maximum



safe temperature, the supercharging high wattage circuit automatically opens. As more heat is needed to complete the cooking operation, the circuit again closes but this time the two coils are in series across 236 volts drawing 1,200 watts. This is done by closing R onto 5, S stays open, T closes onto 3, U to 2 and V to 1.

During the supercharge period, blade U is in contact with contact 11 and contact 2 is open. This results in bus L 2 being dead from contact 2 point to the other surface units and to the oven. It is this point which limits the demand of the range since only one unit can be on supercharge at one time and any supercharger circuit being closed automatically opens the oven circuit. Proper baking is reported not impaired because of the large thermal capacity of the oven and the short duration that the circuit is opened.

This technique is reported to bring to the electric range the speed of the open flame and to control the cooking vessel temperature at the desired point. The development is stated to have been successfully applied to "off-on" switches and to 3 and 5 position heat switches.



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NEWS ABOUT PEOPLE

Mississippi Power Elects Two New Vice-Presidents

Directors of the Mississippi Power & Light Co., Jackson, Miss., have recently elected R. B. Wilson and Les M. Taylor, members of the managerial staff, vice-presidents.

R. B. Wilson

Mr. Wilson started with the company in 1926 as groundman on a Delta line

L. M. Taylor

crew, and advanced steadily until he became assistant general manager in 1945.

Mr. Taylor became identified with the Mississippi utility in 1931 on the sales staff, and had advanced to general sales manager in 1940. Mr. Taylor served as Mississippi chairman of the industrial salvage campaign, undertaken by WPB to stimulate the flow of industrial scrap to the nation's steel mills.

•

Alan Brown Appointed Manager of Distribution

Announcement has been made of the appointment of Alan Brown to the position of general manager of distribution of the Gatineau Power Co., Ottawa, succeeding J. S. Parker, retired.

A. Brown

Mr. Brown has been connected with the Gatineau Power Co. since 1926. He is a member of the Engineering Institute of Canada and a past-president of the Canadian Electrical Association.

•

▶ JOSEPH D. LAWRENCE has been appointed assistant division manager of the Roanoke Division of the Appalachian Electric Power Co. with headquarters at Roanoke, Va. Mr. Lawrence has been connected with the company since 1923 and has been district manager at Logan, W. Va., for the past three years. S. R. PRITCHARD, who has been with the company in Welch, W. Va., since 1934, has been appointed district manager of the Logan district of the company at Logan, W. Va.

General Cable Names Pettee Chief Electrical Engineer

Announcement has been made by the General Cable Co., New York, of the appointment of Allen D. Pettee as chief electrical engineer.

Mr. Pettee has been identified with the General Cable organization since 1929. He became consulting engineer,

A. D. Pettee

cable accessories, at Perth Amboy in 1930 and the following year he was sent to Chicago as district engineer, where he remained for twelve years. From 1943-45 he served as technical superintendent at the Bayonne (N. J.) plant. For the past year he has occupied the position of assistant chief engineer.

During World War II, Mr. Pettee was instrumental in the development and manufacture of large quantities of Navy and Maritime Commission shipboard cable and Navy telephone cable. As technical superintendent of the Bayonne plant he was in charge, also, of all technical details in the manufacture of the lead pipe of the HAIS armored lead pipe assembly for the highly secret petroleum pipeline across the English Channel, which contributed heavily to the rapid Allied advance through France.

Before his association with General Cable, Mr. Pettee had been connected with Jackson and Moreland, Boston; American International Shipbuilding Corp., Hog Island, Pa.; International Harvester Co., Chicago, and the New York Edison Co.

•

▶ IVAN C. EPPLEY has been made assistant manager of the electrical engineering division of the Dayton (Ohio) Power & Light Co. The electrical planning department is now under the management of HAROLD E. DEARDORFF. Mr. Eppley became identified with the company in 1924 as an assistant electrical engineer. Since first joining the company, Mr. Deardorff

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Plant: 40 Stanley St., Buffalo
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•

Hepler Gets New Executive Assignment from Trumbull

Carroll D. Hepler has been appointed vice-president in charge of manufacturing of the Trumbull Eelectric Manufacturing Co., Plainville, Conn.

Mr. Hepler was recently transferred to the East from San Francisco. He joined the Trumbull organization in 1928 at the time of purchase by Trumbull of the A. G. Manufacturing Co. of Seattle,

C. D. Hepler

Wash., and Los Angeles, Calif. He was appointed president of the Pacific Division of the Trumbull Company in 1945, moving from Seattle to new headquarters at San Francisco. He will continue to serve as president of the Pacific Division in addition to his new duties.

A graduate electrical engineer of the University of Washington, Mr. Hepler is a professional engineer in that state and is a past-president of the Electrical Club of Washington.

•

▶ WILLIAM E. LANDERS, manager of the city electric system in Murfreesboro, Tenn., has been elected president of the Middle Tennessee Electric Managers Association.

▶ DONALD L. BROWN, patent counsel and a director of Polaroid Corp., Cambridge, Mass., since its founding in 1937, has been appointed a vice-president of the organization.

Johns-Manville Assigns New Duties to S. V. Dillon

S. V. Dillon has been named staff manager, electrical section, Johns-Manville Sales Corp., a subsidiary of Johns-Manville Corp.

S. V. Dillon

Mr. Dillon has been associated with Johns-Manville since 1920, serving as an electrical specialist in the sales engineering department and as assistant manager, public utility and electrical department, until his present promotion as staff manager, electrical section.

Other recent appointments include the assignment of J. A. O'Brien, vice-president of the Sales Corp., as manager of the power products and industrial department. Mr. O'Brien has been identified with the J-M organization since 1915. H. R. Berlin has been elected vice-president of the Sales Corp. and is appointed manager of the building materials and general department of the company. Mr. Berlin joined J-M in 1926. C. G. Dandrow has been elected a vice-president of the Sales Corp. and is appointed general sales manager of the power products and industrial department. A graduate of M.I.T., he became identified with Johns-Manville in 1922.

L. M. Cassidy and T. K. Mial have been elected vice-presidents of the Johns-Manville Corp. Mr. Cassidy was formerly a vice-president of the Sales Corp. in charge of the building materials and general department and Mr. Mial, also formerly a vice-president in the Sales Corp., was in charge of the power products and industrial department.

L. R. Hoff, vice-president of Johns-Manville Corp. in charge of sales, has retired after 45 years of service. Mr. Hoff headed J-M sales activities for the past 35 years. Since his retirement, he has established himself as an independent consultant and will serve Johns-Manville as a consultant on trade association matters.

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▶ E. M. HAWKINS, JR., formerly connected with the Virginia Electric & Power Co., has been appointed general manager of the utilities in Danville, Va., to succeed the late E. C. Brantly.

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Electronic Corp. Appoints Mountjoy Vice-President

Announcement has been made by the Electronic Corp. of America of the appointment of Garrard Mountjoy as vice-president in charge of engineering.

G. Mountjoy

Well known in the electronic field, Mr. Mountjoy has been director of radio research and development and director of New York laboratories of Lear Inc.; head of the license consulting section of the RCA License Laboratories, and chief engineer of the Sparks Withington Co., Jackson, Mich.

He holds more than 30 domestic patents and numerous foreign patents on radio and television, and is the author of many technical articles in the field. In 1940 Mr. Mountjoy received a "Modern Pioneer" award from the National Association of Manufacturers for his contribution to the improvement of the American standard of living.

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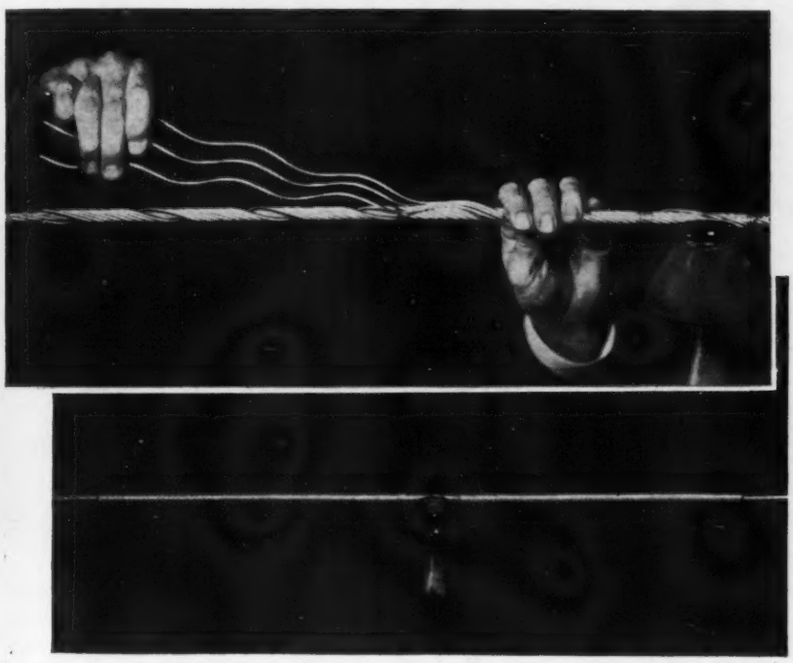
▶ RAYMOND H. REHRER, who has been connected with the electric utility industry since 1920, has been appointed domestic sales manager of the New Jersey Power & Light Co., Dover, N. J., succeeding DONALD M. MOROUGHAN, who has become identified with the General Electric Co. Mr. Rehrer has been connected with the Dover utility since 1941 and has served as supervisor of

—STANDARD—
PREFORMED ARMOR RODS

(Type P.F.T.)



INSTALLED BY HAND
•
QUICK
•
UNIFORM
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HOLD FAST

No tools are necessary to install Standard *Preformed* Armor Rods—they are quickly and easily applied to the conductor *by hand!* Standard *Preformed* Armor Rods grip the conductor firmly, cover the conductor completely and permanently hug it tight without the use of binding clamps, thereby providing an effective means of dampening vibration without damaging the conductor.

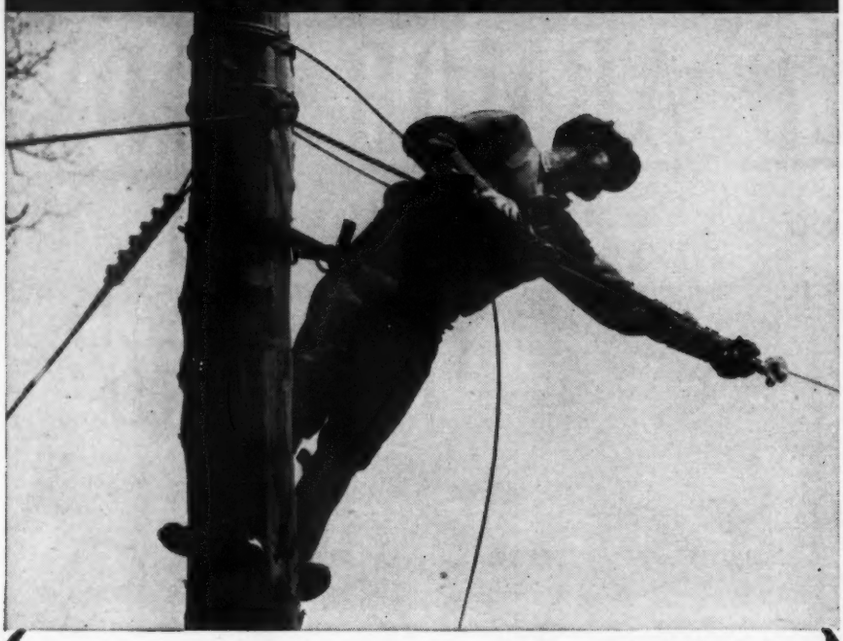
In addition, Standard *Preformed* Armor Rods may also be used to repair ACSR, Copperweld or steel strand where one or more of the strands have been broken. Now that Standard *Preformed* Armor Rods are available it is no longer necessary to cut out the broken piece and splice in a new section of wire. Simply twist Standard *Preformed* Armor Rods over the damaged wire and strength is restored quickly and efficiently. Add to these advantages the fact that Standard *Preformed* Armor Rods offer an ideal protection for attaching hot line clamps and it's readily understood why so many operators are "Switching to Standard"!

Write or wire for complete information.

STANDARD ELECTRIC COMPANY

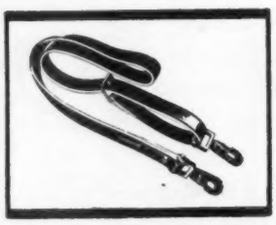
15919 CHADBOURNE ROAD **CLEVELAND, OHIO**

BUCKINGHAM Quality Pays Off *in Greater* SAFETY, DURABILITY & ECONOMY



Backed by nearly a half century of outstanding quality reputation, Buckingham linemen's equipment is favored by an impressive list of utility companies, telephone companies and individual linemen . . . because Buckingham quality pays off . . . in greater safety . . . in longer wear . . . and in lower cost over the years.

And quality in the product is reflected in quality of the design. Quality that means a larger measure of comfort and convenience. The man with Buckingham equipment gets more done because he works with complete freedom of movement, complete confidence in his safety devices, and relative freedom from annoyance and fatigue.



BUCKINGHAM STANDARD SAFETY STRAP, No. 42A. The full responsibility for the life and limb of the wearer is foremost in the minds of the experts who make these straps. Only the backs of the best selected harness leather is used. Buckle end is reinforced with metal for greater strength and to prevent wear.

BUCKINGHAM CUSHION DELUXE FLOATING TOOL BELT, No. 56R. Buckingham is the originator of the rolled edge feature that gives a cushion effect and the greatest comfort to the wearer. Floating feature allows full tool loops under all working conditions. Made of the best chrome tan leather.

BUCKINGHAM (Stephens) CLIMBERS Series 27 Light weight offset shank prevents Climber from slipping back on leg.

Write today for Catalog 24 showing the full Buckingham line.
Buckingham distributors in many large cities.

BUCKINGHAM MANUFACTURING CO., INC.
BINGHAMTON, N. Y.

customer accounting and as office manager. Previously he was identified with the Metropolitan Edison Co., South Carolina Electric & Gas Co., Daniel Starch & Staff, and the New York Electric & Gas Corp.

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International G. E. Names Boynton Vice-President

Kenneth K. Boynton has been elected vice-president of the International General Electric Co., Inc. Mr. Boynton will

K. K. Boynton

be in charge of I.G.E.'s relationships with associated companies in Europe, and will be the senior representative for all the company's business there.

He joined International as an engineer in 1919, and was sent to Yokohama, Japan, one year later. In 1923 he went to General Electric of South America in Mexico City, and became general manager of that office in 1931. Prior to his new appointment, he was president and chairman of the board of GESA of Mexico.

Two appointments in the New York office of I.G.E. were recently announced. Arthur T. Brown, for the past 16 years counsel and manager of the company's law department, has been appointed assistant to the president. Gerard Swope, Jr., who has returned from military service, succeeds Mr. Brown as counsel and manager of the law department. Mr. Brown joined I.G.E. in 1919. Previous to joining the legal staff of the General Electric Co. in 1940, Mr. Swope engaged in the practice of law in New York and was associated with the Securities and Exchange Commission in Washington for three years.

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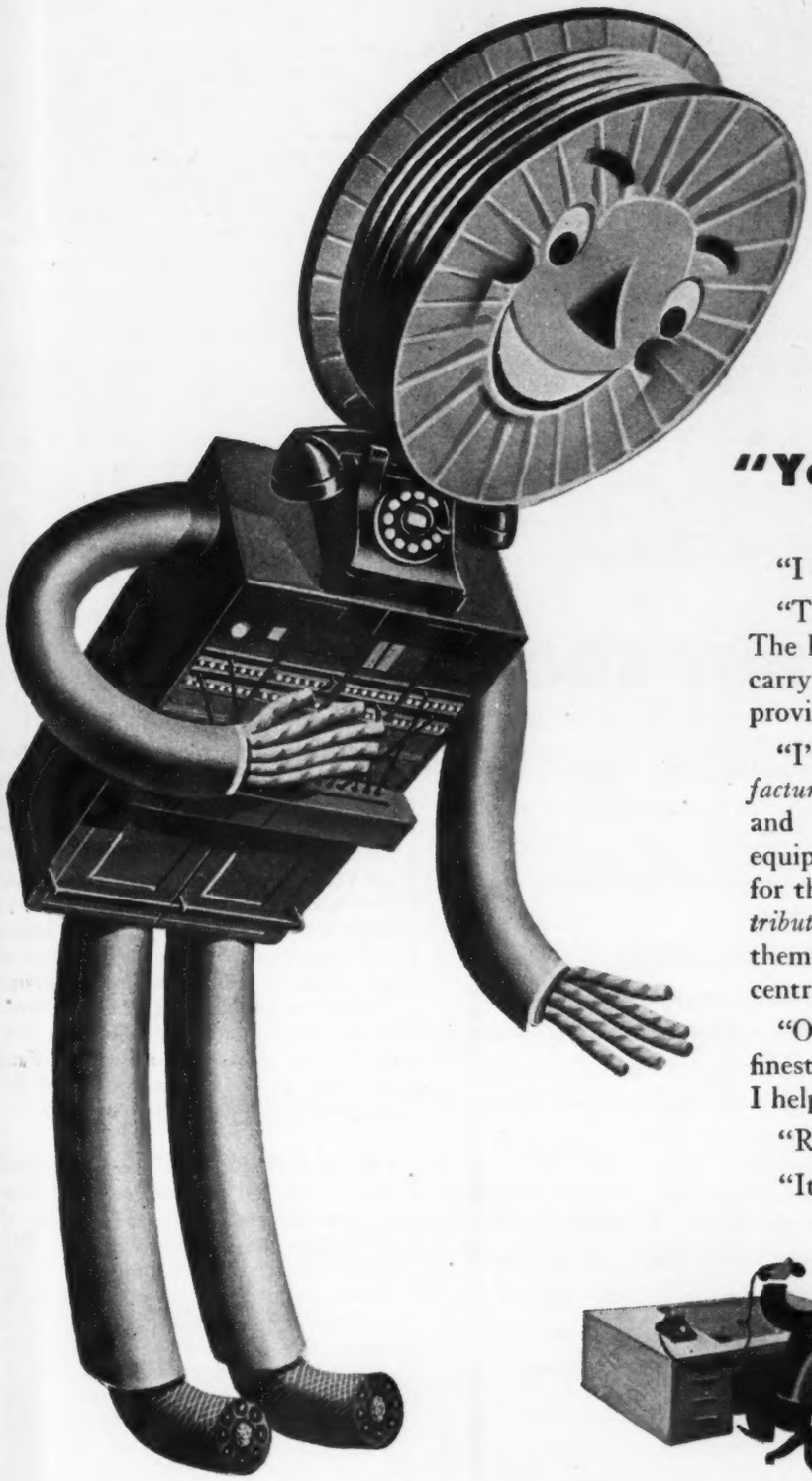
► HUGH PETTEE has been appointed assistant superintendent of transmission, Central Maine Power Co., with headquarters at Augusta. He joined the company as a lineman in 1922 and in



"You rang for me?"

"I have been working for you for years.

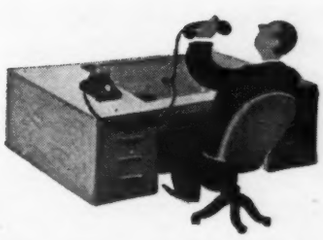
"That telephone in your hand, I made. The long thin wires, the stout cables that carry your voice at the speed of light . . . I provided them, too.

"I've been busy . . . since 1882 . . . *manufacturing* telephones, switchboards, cable and other Bell System apparatus and equipment. I *purchase* supplies of all kinds for the Bell Telephone companies . . . *distribute* all this material and equipment to them throughout the nation. I *install* central office switchboards.

"Our nation's telephone service is the finest and most economical in all the world. I help make it possible.

"Remember my name . . .

"It's Western Electric."



MANUFACTURER... of 43,000 varieties of telephone apparatus.

PURCHASER... of supplies of all kinds for telephone companies.

DISTRIBUTOR... of telephone apparatus and supplies.

INSTALLER... of telephone central office equipment.

FOR THE BELL SYSTEM

Western Electric

HELICOPTERS—HOW SOON?

This Army XR-8 helicopter and its military successors, designed and produced by Kellett, are helping us prepare to produce advanced helicopters to fit the needs of commerce and industry. Sixteen years of aircraft manufacturing experience equip us to understand those needs, and to approach the helicopter's future confidently.

No longer is the helicopter's *flying flexibility* questioned. It is being demonstrated every day. Any well-designed helicopter is completely at home flying *forward, backward or sidewise*, taking off and landing *vertically* in open land or water space of tennis-court size—hovering *motionless* within talking distance of the ground. The same helicopter travels across country at speeds greater than your car can hold on an express highway.

The day may not be far away when helicopters, developed from present models, will perform many money-saving, time-saving tasks. Aerial surveys and patrols, crop-dusting, repair and relief missions, mineral and petroleum exploration and the transportation of passengers or goods will afford countless opportunities to *do the job better by helicopter*.

Kellett's immediate objective is to develop helicopters with adequate range, capacity and stamina to meet exacting requirements. That is a goal worth reaching. We intend to attain it as rapidly as possible.

KELLETT AIRCRAFT CORPORATION, UPPER DARBY, PA.

KELLETT
HELICOPTERS

addition to serving in the stores department has had an active part in the construction of the system's 110-kv. transmission facilities.

▶ W. J. HERRMAN, formerly vice-president of Telephone Bond & Share Co. of Chicago, has joined the Commonwealth & Southern Corp., New York, as rate analyst. An engineering graduate of the University of California in 1922, Mr. Herrman spent his first years after college with the Westinghouse Electric Corp. and Great Western Power Co. of California. In 1933 he became a partner in the investment firm of H. R. Baker & Co. and as a result of this combination utility-financial background, was frequently employed as an expert on rate of return, cost of money and related subjects. Subsequently, he became engaged in rate analysis and joint accounting matters between telephone systems for Telephone Bond & Share Co. and its affiliates.

▶ W. LOWRY MANN, manager of the York division of the Metropolitan Edison Co., Reading, Pa., has retired. Mr. Mann played an important part in the early development of the hydroelectric resources of the Keystone state. In 1911 he became general manager of the York Haven Water & Power Co., whose hydro plant was located on the Susquehanna River, at York Haven. When that company was acquired by Metropolitan Edison Co. about 1923, Mr. Mann was made local manager. Three years later he was made division manager when the system had been expanded by the purchase of the electric utility properties serving Hanover and Gettysburg, Pa. He served in that position continuously since 1926. On the eve of his retirement, Mr. Mann was guest of honor at a testimonial dinner tendered him by the company.

▶ RUSSELL H. REED has been appointed director of the electric research farm project undertaken by the College of Agriculture at the University of Wisconsin under a grant provided by the Wisconsin Utilities Association. Mr. Reed holds two degrees from the University of Wisconsin and for ten years prior to the war was engaged in research and instructional work in the agricultural department of the University of Illinois.

▶ JAMES G. LINDLEY has been appointed chief of the regional branch of operation and maintenance, U. S. Bureau of Reclamation. Prior to this appointment, and since 1942, Mr. Lindley was project director of the War Relocation Center at Amache, Colo., in charge of the activities of 8,000 evacuees. Chief among the duties of the regional branch of operation and maintenance that lie immediately

ENGINEERING HALL, UNIVERSITY OF ILLINOIS

A Leading University

USES BUELL FLY ASH PROTECTION

POWER PLANTS throughout the industries and institutions that serve America recognize the efficiency of Buell (van Tongeren) Collectors as a protection against fly ash dispersion.

Among the various power plants using Buell Fly Ash Collectors is a leading American educational institution, the University of Illinois at Champaign. The plant of the University has used six Buell Collectors with its stoker-fired boiler, for the elimination of fly ash, over a period of several years.

In fact it may be said that power plants employing Buell Collectors represent a fair cross-section of American industry. They include such well known concerns as: BETHLEHEM STEEL COMPANY, STEELTON, PA., PHILADELPHIA NAVY YARD, WEST-VACO CHLORINE PRODUCTS CORPORATION, CONNECTICUT LIGHT AND POWER COMPANY, JACOB RUPPERT BREWERY.

Detailed information on Buell Collectors to meet your specific fly ash requirements will be gladly furnished upon request.

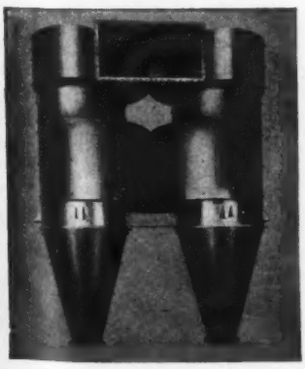


Illustration shows typical unit of a battery of six Buell Fly Ash Collectors installed with stoker fired boiler in power plant of University of Illinois.

BUELL ENGINEERING COMPANY, INC.
70 Pine Street, New York 5, N. Y.
Sales Representatives in Principal Cities

CONSULT BUELL *First* IN DUST RECOVERY
FOR CHEMICAL • ROCK PRODUCT • METALLIC • FOOD • FLUE OR ANY OTHER DUSTS

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DUST RECOVERY SYSTEMS

FOR COMPLETELY AUTOMATIC AND DEPENDABLE VOLTAGE REGULATION

Burlington Synchrostat
(REG. U. S. PAT. OFF.)
VOLTAGE REGULATOR

The Burlington Synchrostat, Type SR, Model SF, has proven to be the answer to the problem of voltage regulation in numerous installations. Its inherent sensitivity in following voltage changes makes it respond quickly and accurately in restoring generator voltage to normal.

SPECIAL FEATURES ARE:

Simplified control . . . rugged construction . . . simple installation . . . minimum maintenance . . . unaffected by reasonable vibration . . . automatic polarity reversal . . . rapid, positive response to maintain normal voltage.

Write today for full particulars **and** application data.

BURLINGTON INSTRUMENT CO.
305 FOURTH STREET BURLINGTON, IOWA

PANEL INSTRUMENTS • VOLTAGE REGULATORS • AUTOMATIC SYNCHRONIZERS • FREQUENCY REGULATORS

ahead are the prosecution of the repayment contracts with irrigation districts that are to be served water by the Central Valley Project, and completion of the Bureau's plans for opening to homestead entry about 7,000 acres of the Klamath Project, Oregon-California.

▶ CURTIS E. CALDER, chairman of the board of the Electric Bond & Share Co., and JOSEPH V. SANTRY, president, Combustion Engineering Co., have been added to the board of directors of the National Association of Manufacturers.

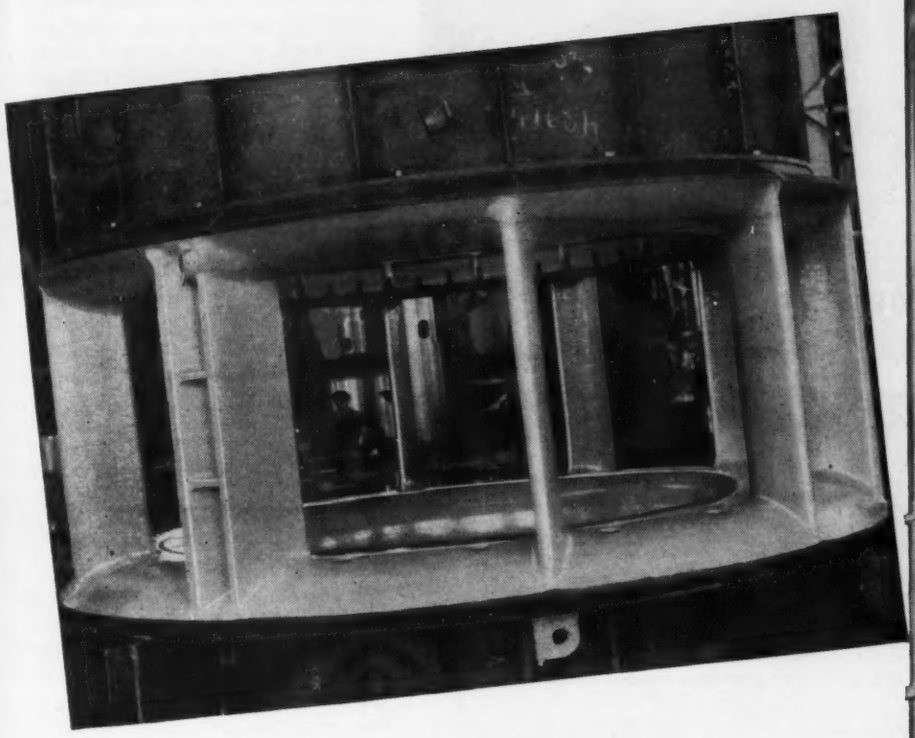
▶ FRANK L. NASON, New England district manager of Westinghouse Electric Corp., has been elected president of the Electric Institute of Boston, Inc., succeeding T. S. Knight. Mr. Nason entered Westinghouse service in 1911 as a sales assistant; became central station manager in 1922, and in 1938 was placed in charge of the New England district.

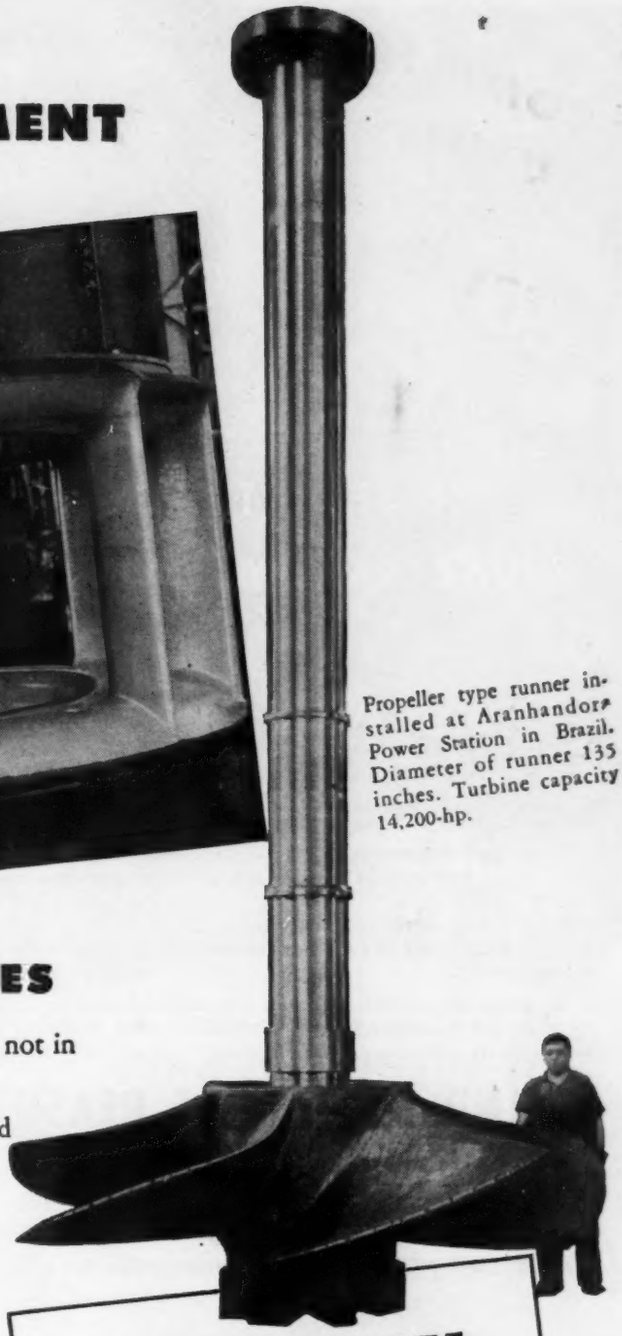
▶ HARRY S. WALKER has been appointed manager of the radiant heat division of the C. M. Hall Lamp Co., Detroit. He succeeds THOMAS P. CUSACK, Jr., newly appointed manager of the sales development division for the entire company. Mr. Walker for the past eight years has represented the Westinghouse Electric Corp. on various engineering and sales assignments in New York, Pittsburgh, Toledo, Louisville and Detroit.

▶ HOWARD L. CLARY, formerly manager of sales promotion, has been appointed assistant general sales manager of the Norge division, Borg-Warner Corp., Detroit. Mr. Clary has been in the appliance business since 1927 and has been associated with the sale of Norge products during the entire intervening period with the exception of the last three years when he was connected with the War Production Board in Washington. E. J. KANKER, formerly assistant to M. G. O'Harra, vice-president and general sales manager, has been named to the newly created position of director of market research. E. R. BRIDGE, refrigeration sales manager, has been appointed merchandise manager. Advertising, sales promotion, sales training, publicity and public relations have been consolidated under C. H. MACMAHON, director of advertising and public relations.

▶ HARRY S. AMER has retired after a 37-year career as an incandescent lamp development engineer with the Westinghouse Lamp Division at Bloomfield, N. J. Mr. Amer went to Bloomfield immediately after he was graduated from the Pennsylvania State College in 1909. During his career, Mr. Amer has been engineer in charge of lamp development, staff assistant to the chief engineer, and assistant

For economical
LOW HEAD DEVELOPMENT





Propeller type runner installed at Aranhandora Power Station in Brazil. Diameter of runner 135 inches. Turbine capacity 14,200-hp.

PROPELLER TYPE TURBINES

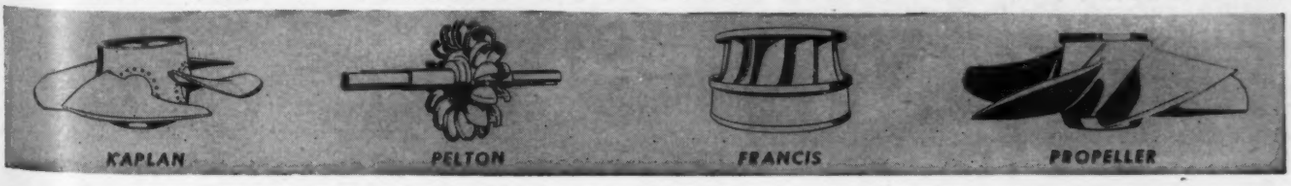
Propeller type turbines are indicated for heads not in excess of 100 feet and in cases where water economy, at heads considerably lower than the rated output, is not of primary importance. The selection of the proper turbine, to suit the conditions of any particular installation, is essential for economical development of water power. Baldwin engineers have been solving problems of this kind for many years. Perhaps they can assist you.

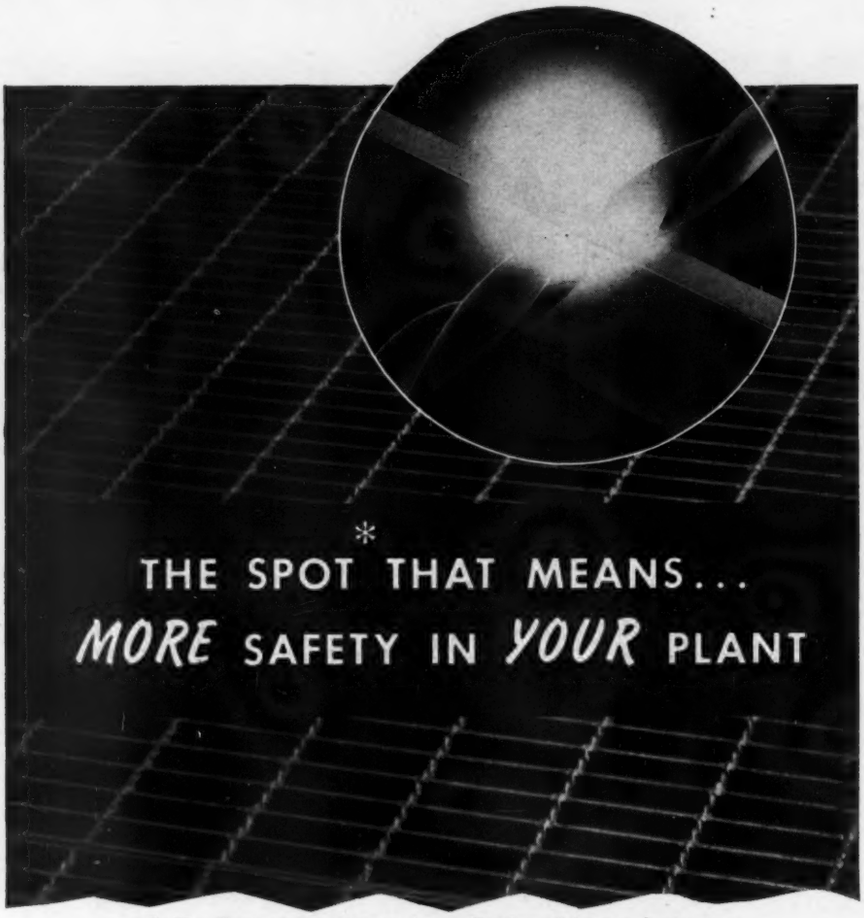
BALDWIN
HYDRAULIC TURBINES

THE BALDWIN LOCOMOTIVE WORKS • PHILADELPHIA, PA., U. S. A.

I. P. MORRIS DEPARTMENT, EDDYSTONE, PA. • THE PELTON WATER WHEEL CO., SAN FRANCISCO, CALIF.

BALDWIN HAS A TURBINE FOR EVERY TYPE OF INSTALLATION





THE SPOT THAT MEANS...
MORE SAFETY IN *YOUR* PLANT

* The illustration expresses the application of heat and pressure used to forge crossbars and bearing bars into one integral unit.

There's a big difference between ordinary grating and Blaw-Knox steel grating safety. For Blaw-Knox is the *only* grating with the electroforged *twisted bar.*

In factories, on cat-walks—see to it that skid-breeding floors are made skid-proof in any weather. Specify Blaw-Knox steel gratings, the only gratings with built-in twisted-bar safety factor.

...AND HERE ARE 5 REASONS WHY

1. **SELF-CLEANING, no sharp corners to clog.**
2. **MAXIMUM OPEN AREA for light and air.**
3. **EASY TO MAINTAIN... paint reaches entire surface.**
4. **STRONG electroforged construction for easy erection.**
5. **SAFE footing at all times with twisted cross bar.**

When further improvement in open-steel floors is called for by changes in business practice—Blaw-Knox will lead as always.

Blaw-Knox Catalog No. 1887 gives complete details on Blaw-Knox Electroforged Steel Grating. Send for it.

DIVISION OF BLAW-KNOX COMPANY
2013 Farmers Bank Building, Pittsburgh 22, Pa.

Seven Blaw-Knox plants have been awarded the Army-Navy "E", and have regularly received renewal stars for continued high achievement in the production of war material.

BLAW-KNOX GRATING

manager of lamp engineering. He is a former member of the Electro-Chemical Society, the Illuminating Engineering Society and the American Association for the Advancement of Science.

▶ PAUL L. LINDSAY has been named general staff manager—sales—of the American Steel & Wire Co., a U. S. Steel subsidiary. Mr. Lindsay, in addition to other duties, will assume the responsibilities of V. H. Farr, assistant general manager of sales, who retired December 31 after 45 years of service with the company.

▶ B. B. TURNER, sales manager with the Globe American Corp., Kokomo, Ind., for the past twelve years, has been appointed sales manager, range division, The Maytag Co., and has established headquarters at the Maytag home office, Newton, Ia. The Maytag Co. recently purchased a minority interest in the Globe-American Co. and will distribute its entire output of Dutch Oven gas ranges.

▶ GEORGE W. BACON, one of the founders, 52 years ago, of the engineering firm of Ford, Bacon & Davis, Inc., retired on March 12 from the position of chairman of the board of directors which he has held for 18 years. This date is the anniversary of the day that Mr. Bacon and the late Frank R. Ford, in partnership with George H. Davis, started the organization. Mr. Bacon was honored by 200 industrialists, bankers and other business leaders at a luncheon given by directors of the company. James F. Towers, president of Ford, Bacon & Davis, and Mr. Davis, now retired, paid tribute to Mr. Bacon at the luncheon.

▶ FLOYD AVERY has recently been appointed sales manager in charge of marketing and advertising for Schweitzer & Conrad, Inc., Chicago, according to an announcement by Nicholas J. Conrad, President. Mr. Avery was recently general works manager of Brush Development, Cleveland, large war-time manufacturer of magnetic wire recorders. By this change, Mr. Avery returns to S & C and to the high voltage protective and switching equipment industry, having previously spent 14 years with the company. He started in production engineering and control and later served as assistant to the general manager, then as general manager.

▶ R. L. TRIPLETT, president of the Triplett Electrical Instrument Co., Bluffton, Ohio, has been made first vice-president of J-B-T Instruments, Inc., New Haven, Conn., and PHILLIPS STEVENS, personnel director and assistant to the president, has been elected vice-president for sales and public relations. One of the J-B-T

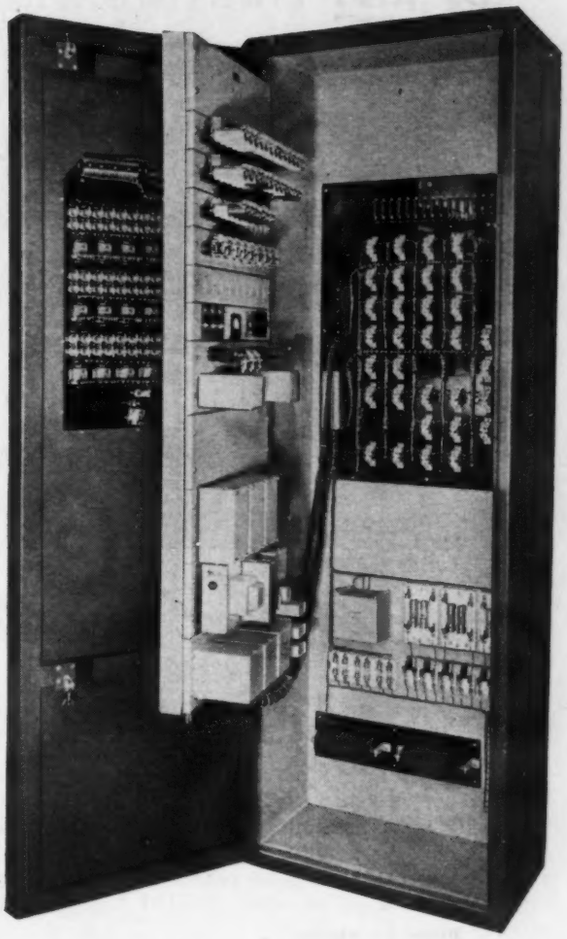
SUPER-TROL* *Cuts Operating Costs*

OPERATING costs drop when Control Corporation supervisory and remote control equipment is installed because all generating and distribution equipment can be efficiently coordinated into one integrated system, under the centralized control of the dispatcher. Indicating lamps on his control panel always show the condition of each piece of equipment, with changes automatically appearing on his panel as soon as they occur at a distant substation or generating plant.

Errors and delays in operating equipment are eliminated with SUPER-TROL because the dispatcher himself operates all equipment from his dispatching panel. Audio frequency control signals eliminate any possibility of incorrect operation, and indicating lamps immediately advise him that the operation he has called for has been correctly completed.

Installation costs are less with SUPER-TROL because a single pair of wires carry all supervisory, remote control and telemetering signals and provide telephone facilities as well. Carrier current can eliminate the need for a metallic circuit and show substantial savings on longer circuits.

Swinging relay panels and plug-in relays cut maintenance costs to a minimum and permit inspection and repair of all SUPER-TROL equipment without removing any equipment from service. With plug-in relays any relay trouble can be corrected in a few seconds.



Find out about the system that cuts operating costs—

Write today for SUPER-TROL Bulletin that gives detailed description of this supervisory and remote control equipment—learn about its many advantages as concerns your operation.

•

*** SUPER-TROL is the Control Corporation name for supervisory and remote control equipment.**

•

CONTROL CORPORATION
720 CENTRAL AVENUE
MINNEAPOLIS 14, MINNESOTA

THE REFLECTOR IS THE BACKBONE OF ANY LIGHTING SYSTEM . . .

Skilled Lighting

Means Light that is RIGHT

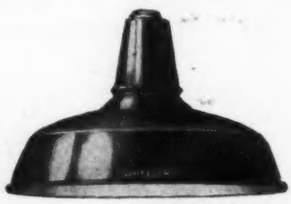
The elimination of eye strain, glare, and shadows is just as important as a high level of illumination. Skilled Lighting, the Wheeler way, puts the right amount of light in the right places to achieve four benefits that have an important bearing on profits: greater manual speed, increased accuracy, less spoiled work, and improved worker morale. Skilled Lighting makes your plant a better place to work.

The broad line of Wheeler Reflectors is the backbone of Skilled Lighting. It offers the right fluorescent or incandescent reflector for every area or "spot" in your plant. All are built of heavy gauge metal for long, hard service.

Look in the Wheeler Catalogs for reflectors that show the results of Wheeler's advanced engineering based on 65 years of manufacturing experience. For copies, write to: **Wheeler Reflector Company, 275 Congress St., Boston 10, Mass.** Representatives in principal cities.

All-Steel Open-End Fluorescent Unit

Available for two or three 40-watt, or two 100-watt lamps. Broad wiring channels with accessible, enclosed ballast. Can be mounted from chain or conduit, individually or in continuous runs.



RLM Solid Neck Incandescent Reflector

Maximum lighting efficiency for either indoor or outdoor use. Expertly designed, ruggedly built. 75 to 1500 watts.

Distributed Exclusively Through Electrical Wholesalers

Wheeler Skilled Lighting REFLECTORS

Made by Specialists in Lighting Equipment Since 1881

founders, Mr. Triplett served as president for a few months in 1939-40, and since has been a member of the board.

▶S. V. Reiss has joined the Graybar Electric Co. in the capacity of manager of commercial research, with offices at executive headquarters in the Graybar Building, New York.

▶R. H. Carlsen has been appointed sales promotion manager of the Koiled Kord division of Kellogg Switchboard & Supply Co., Chicago. In his new position Mr. Carlsen will work closely with R. C. Krueger, manager of the Koiled Kord division, on plans for aiding distributors and jobbers in national merchandising of the new Kellogg appliance cord sets.

OBITUARY

Francis A. Stratton

Francis A. Stratton, formerly president of the Westchester Lighting Co., died at his home in Mt. Vernon, N. Y., on March 3. He was 93 years old. He retired from business 13 years ago.

Mr. Stratton was largely instrumental in combining the gas and electric lighting plants of a large part of Westchester County into one corporation, and when the Westchester Lighting Co. was organized in 1900 he became its vice-president and general manager. In 1909 he was elected to the presidency and in 1926 he became chairman of the board of directors.

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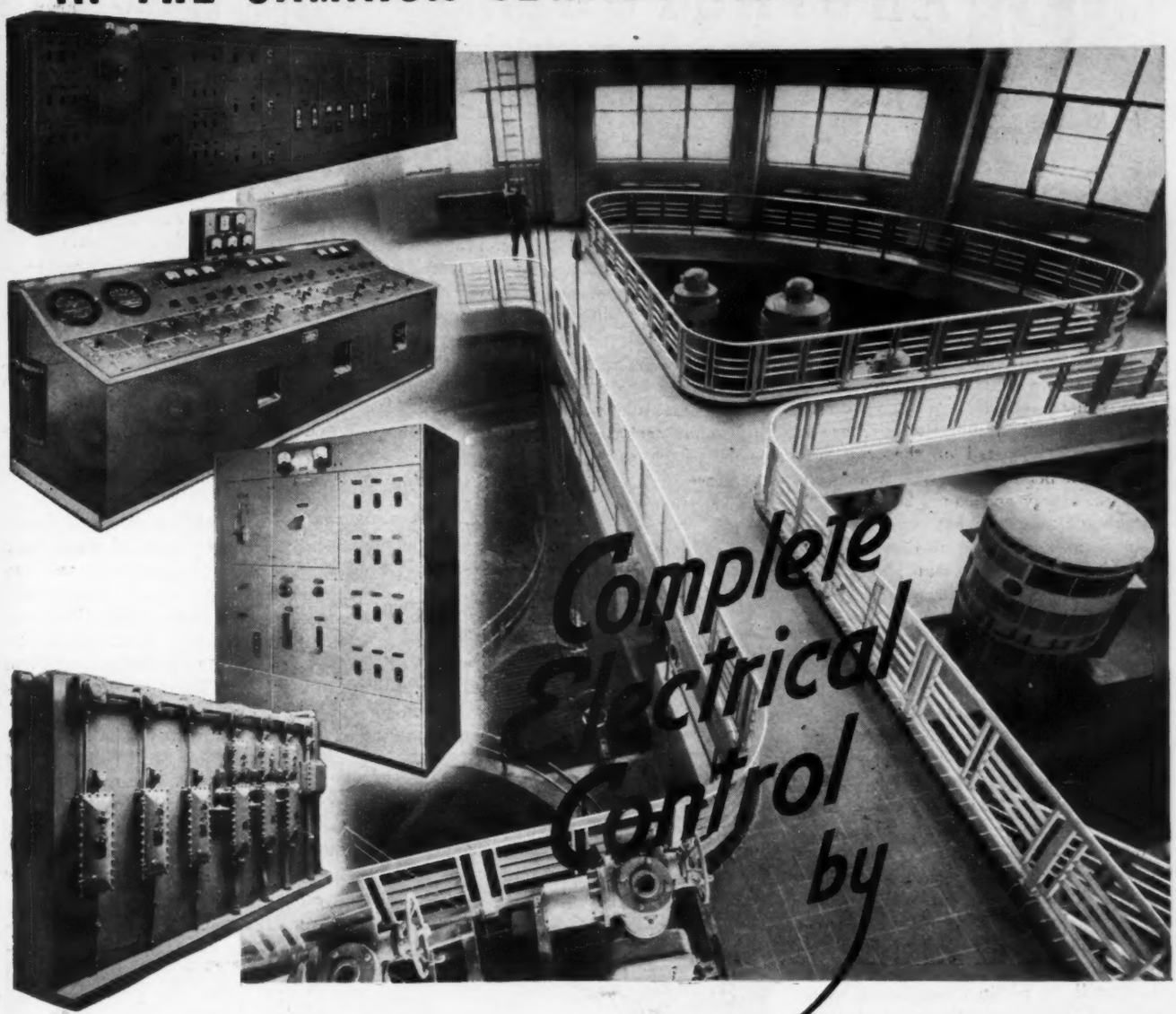
▶Frank C. Barrington, Florida district manager of the Proctor Electric Co., Philadelphia, died on March 1 at St. Francis Hospital, Miami, where he had been taken after a severe heart attack. He had been ill but a few days. Mr. Barrington started in the electrical business when he organized the Columbian Electrical Co. as a dealer-contractor. He resigned the presidency of Columbian to go with the St. Joseph (Mo.) Railway, Light, Heat & Power Co. as commercial manager. He then became identified with Westinghouse, an association he maintained for 30 years, serving in New York, St. Louis, and Pittsburgh. It was in 1945 that he become Florida district manager for Proctor.

▶Albert L. Scott, president of Lockwood Greene Engineers, Inc., New York, died on March 2 of a heart ailment at his home at Chappaqua, N. Y. He was 67 years of age. Born in Cleveland, Mr. Scott began his engineering work with Lockwood Greene in 1900, holding various executive positions until he became president in 1926.

FOUR of the 18 METROPOLITAN SWITCHBOARDS IN THE JAMAICA SEWAGE DISPOSAL PLANT



At the right are listed various types of electrical control equipment designed and furnished by METROPOLITAN for utilities, industrial plants, large mercantile establishments, and public buildings. Your inquiries are invited.

Knife Switchboards
Circuit Breaker Switchboards
Dead Front Switchboards
Battery Charging Switchboards
Motor Control Switchboards
Explosion-proof Switchboards
Laboratory and Test Switchboards
Control Switchboards
Generator and Distribution Switchboards

ESTABLISHED 1892 METROPOLITAN TRADE MARK

ELECTRIC MANUFACTURING COMPANY

ELECTRIC LIGHTING AND POWER
DISTRIBUTION EQUIPMENT
LONG ISLAND CITY, NEW YORK

MANUFACTURING MARKETS

Reliance Will Build New $750,000 Plant

Reliance Electric & Engineering Co., Cleveland, will break ground shortly for a new plant in Ashtabula, Ohio, it was made known recently by J. W. Corey, president, in announcing the purchase of a 25-acre site located on the west side of the town between the New York Central right-of-way and Route 20, with 800-ft. frontage along Benefit Ave.

Announcement was also made that Karl H. Meyer, at present manager of the marine division of the company, will become factory manager of the new Ashtabula plant when it is completed.

One story in height, the new plant will contain 120,000 sq. ft. of manufacturing area and employ approximately 500 people working on two shifts. The building itself, to be of the most modern construction, will cost $750,000 and with machinery and equipment will represent a total investment of close to $1,500,000.

Work on the new project will be started as quickly as possible. When completed, the new plant will be used for the production of 1- to 15-hp. electric motors and variable speed drives.

Present Cleveland facilities of Reliance which will be retained include a plant on East 152nd St. and the main plant on Ivanhoe Road, where 48,000 sq. ft. of building now under construction utilizes the last foot of property available at this point. The company's executive offices and the production of its larger motors, generators and variable speed drives will be continued in Cleveland.

•

Consent Decree Eliminates Corning from Lamp Suit

Corning Glass Works and the government have signed a consent decree and thereby terminated that company's participation in the anti-trust suit charging eleven manufacturers with restraint of trade in the manufacture and sale of electric lamps.

Under terms of the decree, Corning is required to license to any manufacturer on a royalty-fee basis its present patents and to license at reasonable royalties all future patents applied for before January 1, 1950. Also, the company must sell bulbs and other lamp equipment at non-discriminatory prices and is required to furnish manufacturers with blueprints and other technical information for a period of five years.

Decree also provides for the relaxing of barriers to the import and export of light bulbs and related products.

•

Butadiene Costs Cut

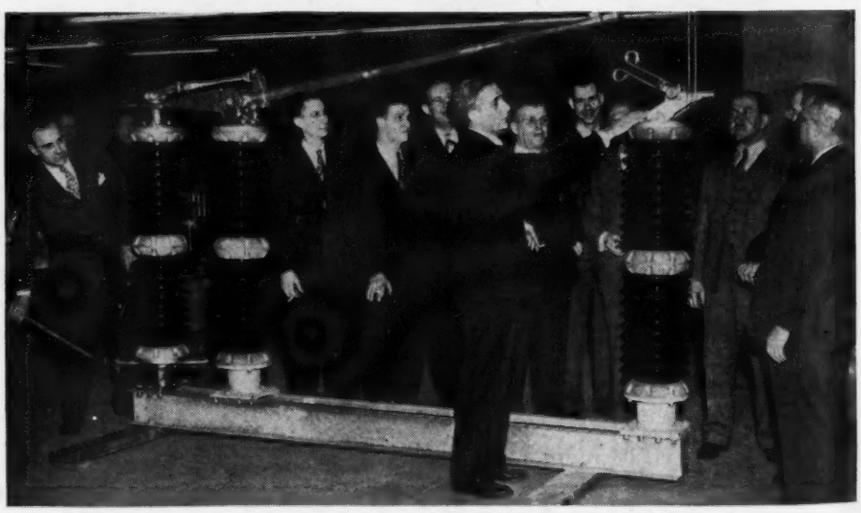
Butadiene has been produced at a cost of nine and one-half cents per pound in a pilot plant which utilizes a refinement of the Schoch process. Dr. E. P. Schoch, chemical engineer and research man for the University of Texas, describes the process as one which will produce acetylene from methane gas by the use of an electrical discharge. The test plant was built and the resulting cost of butadiene is reported at about one half the cost of previously used methods.

Need 120,000 Lamps for Empty Sockets

It will take 120,000 lamps just to fill the empty sockets that have accumulated in American homes during the war, T. D. Scarff, Lamp Division, General Electric Co., told utility executives in Chicago recently at a meeting at which postwar lighting program of the company was revealed. The average American home today needs 3.5 new lamps just to fill empty sockets and replace burned out lamps, Mr. Scarff pointed out.

The commercial lighting market also needs immediate attention. A survey of the lighting need of 2,700 stores in 40 states was cited by Mr. Scarff to show that 69 percent of the stores now without fluorescent lighting want it installed, while 28 percent now using fluorescent light want more. Moreover, the survey showed that 65 percent of store owners will seek electric utilities' advice in making their installations, according to Mr. Scarff.

The G. E. lighting program, introduced by Harold Green of Nela Park, offers a series of educational and promotional tools for use by utility sales organizations in developing these vast store lighting markets. Built around the twin slogan, "Seeing is the Biggest Thing in Selling," and "Lighting is the Biggest Thing in Seeing," the program includes five part correspondence course on commercial lighting for utility and dealer salesmen, plus motion pictures and sound slide films, direct mail circulars, lighting survey forms, and customers' booklets to help store owners plan an engineered lighting installation that is in tune with modern retailing methods.



A ROYAL OPEN HOUSE—P. L. Warren, president of Royal Electric Mfg. Co., center foreground, proudly displays a new 138-kv. airbreak switch to a group of utility engineers attending the recent open house at Royal's new office and factory building in Chicago. Frank E. Schultz, vice-president and general manager of the switchgear firm, turns the operating handle at the extreme left

NEW PROBLEMS?

C-D has new electrical insulating materials to help you solve them

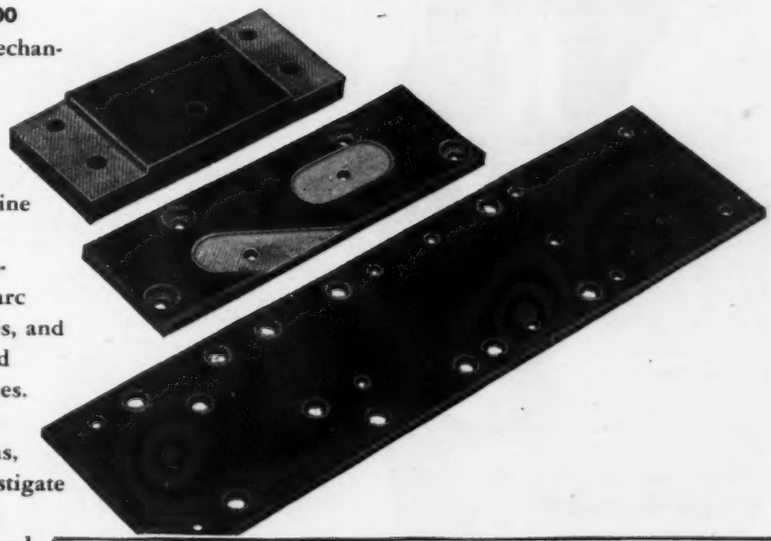
Here are some representative improved properties of various new C-D Electrical Insulating Materials.

Power Factor (at 10^6 cycles per second)	**0.011**
Dielectric Strength, volts per mil.	**750**
Arc Resistance, seconds	**185**
***Insulation Resistance, megohms**	**30,000**

New higher standards are also obtainable on mechanical properties, heat and moisture resistance, dimensional stability and fabricating.

The parts illustrated were fabricated from new grade GB 128 M DILECTO which is a glass fabric base laminate employing a melamine the equivalent of Navy Type GHG. This new grade of DILECTO provides higher heat resistance, greater dimensional stability, superior arc resistance and improved mechanical properties, and is noncombustible when compared to standard paper and cotton fabric base phenolic laminates.

These new C-D insulating materials may be the answer to your "What Material?" problems, and will save you much time and worry. Investigate them while your products are in the planning stage. Wire, phone or write our nearest office and a C-D technician will be made available to you.



*Insulation Resistance values based on samples conditioned for 96 hours at 90% ± 2% relative humidity at 35° ± 1°C.

C-D PRODUCTS

The Plastics

DILECTO—Thermosetting Laminates.

CELORON—A Molded Phenolic.

DILECTENE—A Pure Resin Plastic Especially Suited to U-H-F Insulation.

HAVEG—Plastic Chemical Equipment, Pipe, Valves and Fittings.

The NON-Metallics

DIAMOND Vulcanized FIBRE

VULCOID—Resin Impregnated Vulcanized Fibre.

MICABOND—Built-Up Mica Electrical Insulation.

Standard and Special Forms

Available in Standard Sheets, Rods and Tubes; and Parts Fabricated, Formed or Molded to Specifications.

Descriptive Literature

Bulletin GF gives Comprehensive Data on all C-D Products. Individual Catalogs are also Available.

Continental·Diamond C-D Engineered Dielectrics

RHC—46

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NEW YORK 17 • CLEVELAND 14 • CHICAGO 11 • SPARTANBURG, S. C. • SALES OFFICES IN PRINCIPAL CITIES
WEST COAST REPRESENTATIVES: MARWOOD LTD., SAN FRANCISCO 3
IN CANADA: DIAMOND STATE FIBRE CO. OF CANADA, LTD., TORONTO 8

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Continental-Diamond FIBRE COMPANY

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CANTON 1, OHIO

Field Reports on Business

Strikes have resulted in a large accumulation of orders for a variety of electrical equipment. Civil engineering construction volume in continental United States totalled $68,000,000 for the week ended March 7. Wiring and lighting supplies are in high demand, according to reports from the field.

NEW ENGLAND

Central Maine Power Co. has purchased a 2000-kva transformer for the Pepperell substation in Biddeford. Modernizing and converting Boston hotels used during the war for housing arms services are progressing and sales of electric ranges and refrigerators are being booked. New England Telephone & Telegraph Co. will spend about $45,000,000 for new construction during 1946.

Government buying continues at a trickle. New England manufacturers submitted bids for a fair-sized diversified volume of wiring supplies for overseas use during the past fortnight. Included were small switches, estimated at about $15,000 worth; fuses, insulation, fluorescent lamps and wire. Inquiries for electric welders are coming in from New England manufacturers of metal products and purchasers are receiving early deliveries; welding rod, on the other hand, is tight and structural steel welding yards are at a standstill.

Water supply extensions in the Cape Cod district of Massachusetts are being pushed to care for an expected record summer trade; electric pumping units and controls are included in plans now under consideration. Wiring supplies in the Boston area are practically depleted and many smaller contracts for remodelling are being held up.

PACIFIC COAST

The Pacific Coast has its own special repercussions from national strikes, as pointed out last week, and the San Francisco Bay area, where a machinists' strike is now entering its twenty-first week, has its own on top of that.

Typical of Bay area electrical manufacturing plants is Pacific Electric Manufacturing Co. of San Francisco, closed since October because of machinists' repeated refusal of an 18 percent pay increase. They comprise only 20 percent of the personnel of this plant, the rest being chiefly foundrymen, die and tool makers, and other production men. Result: a huge accumulation of orders urgently needed for such widespread projects as Pacific Gas & Electric Co.'s 230-kv. line from Oroville to Vaca-Dixon and new subs in East Bay; various Bonneville system installations, and other work as far east as Texas and the Midwest. Another firm in the same predicament is Bowie Switch of San Francisco, recently acquired by Chance Co. However, a split in union ranks has just resulted in resumption of shipyard work. Contrary to predictions, the electric load of such cities as Los Angeles has decreased very little from the peak of wartime, clock-round production. Increased business activity and growing population are the chief reasons.

Typical orders include four 1200-amp. 35,500-volt circuit breakers for Los Angeles, fabricated steel for 230-kv. switchyards at Shasta and Keswick and ventilating equipment for Central Valley project, and transformers and line equipment for 132 miles of 115-kv. line in central New Mexico for Alamogordo system. Pacific Coast lamp requirements have been hitherto largely served from the Oakland Lamp Works, now on strike, as well as from eastern factories.

The G.E. coast plant will apparently retain most of its skilled personnel after the strike. Many large municipalities are reported short on traffic and street lamps, with less than a month's reserves. Chain stores are stocked on 40- and 60-watt sizes, but are short or out of 100- and 150-watt. Pacific Gas & Electric Co. has combed its territory for wholesaler's dormant stocks of street series lamps.

NEW YORK

Although steel production is increasing following the recent strike, stocks are extremely low. Sheet and strip steel are the tightest of all steel shapes and are expected to continue in short supply through the early summer. Lumber stocks have declined to the lowest level in ten years.

Demands are so heavy that the low stocks are expected to decline further through the summer and fall months.

Poles and pole line hardware are coming into the New York area at approximately the same rate as in 1941, according to two sources of information. Pole receipts up to date this year exceed those of last year by approximately 15 percent. Many inquiries are being received and subsequent shipment and delivery of fir poles now being made. High tension insulators are being promised for twelve months delivery. Pin types are slightly less.

The effects of recent and current strikes in the wire industry are reflected in the promised delivery dates. The more popular sizes had been on an approximate ten-month basis, and are now on a twelve-month basis. Transmission and distribution equipment orders are exceeding supplies by a ratio of approximately five to one. Best estimates as to when they will be on an even basis vary between 18 months and 30 months.

CHICAGO

Sales of major household appliances by department stores in the Midwest area rose 394.3 percent in January compared with the same month of 1945. In Chicago alone they rose 622.3 percent. Stocks, however, rose only 179.4 percent and 296.1 percent, respectively.

Immediate reductions totaling $5,866,000 a year in residential and commercial rates of four Illinois utilities went into effect March 1 on order of the Illinois Commerce Commission. About 1,394,000 customers were affected.

Increasing use of infrared lamps by industry in the area to speed up drying processes is reported by Commonwealth Edison, as exemplified by Indian Trailer Corp., which installed a huge infrared tunnel that reduced the time required for drying paint coats from several hours to only 12 minutes per coat. The tunnel contains 908 250-watt bulbs on 14 panels. Hitherto, paint-drying had been the bottleneck which prevented the firm from reaching its desired output of 16 coaches per day.

Industrial developments in the area totaled $11,885,000 in February, compared to $4,542,000 in February, 1945, and $10,470,000 this January.

Cory Interlock Produced by New Company

Superior Appliance Co., 71-11 72nd Place, Glendale, N. Y., has been formed to carry on the manufacturing and servicing of Cory Interlock Systems. George B. Thieme, president of the new company, has long been connected with this product.

George B. Thieme

He joined Charles Cory & Son., Inc., in 1924 for the purpose of designing the Cory-Robinson Interlock based on patents issued to engineers of the D. P. Robinson Co. Upon completion of the design program in 1926, he was transferred to the sales department and subsequently became assistant manager of industrial sales.

Bendix Aviation Corp. acquired the Charles Cory Corp. in 1930 and the new company was organized when Bendix discontinued manufacture of the interlocks.

•

General Cable Creates Three New Districts

Eastern sales territory of General Cable Corp. has recently been divided into three separate districts with headquarters offices in New York, Washington and Atlanta.

Heading the New York office is Edward Kerschner who recently completed the contract termination work for the company. The territory served by this office will be New England and the northeast. A. B. Crawford, who was formerly local manager and located in Washington, has been appointed manager of the new Washington district and will serve that city and North Carolina and Virginia.

Former advertising manager, Richard

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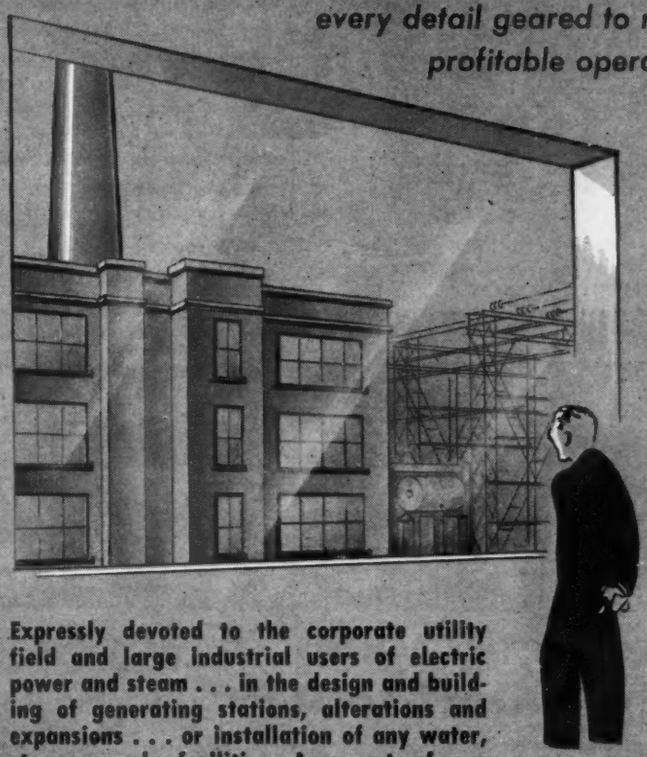

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BLACKBURN Hi-Strength CONNECTORS

The Strongest Connectors Made! ★

SHOWN above is the nut and pressure bar of a BLACKBURN CONNECTOR. Small arrows indicate how this bar is reinforced on both sides. Like the tie rods on a bridge, these two reinforcements greatly strengthen the pressure bar, giving it maximum rigidity and enabling it to distribute the pressure over the entire length of the connection. Thus, the BLACKBURN reinforcing makes a strong connector still stronger, and reduces your maintenance costs!

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FOR OVER 10 YEARS

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WITH THIS FAMOUS
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TRICO RENEWABLE FUSES
with the "different" powder-packed, time-lag, non-interchangeable and tamper-proof element, guarantee you maximum efficiency and dependability. You get THREE TIMES THE SERVICE . . . at NO ADDITIONAL COST.

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literally bolt fuses and clips together supplying the necessary contact for maximum results.

FOR TROUBLE-FREE PERFORMANCE USE THIS FAMOUS
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Write for Bulletins #1 & 6.

TRICO

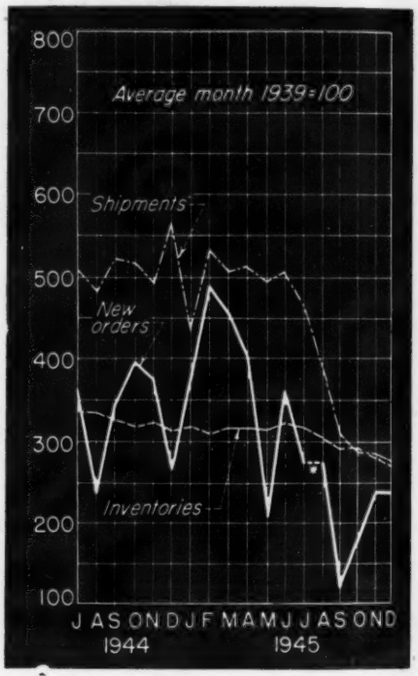
TRICO FUSE MFG. CO.
MILWAUKEE WISCONSIN

Osgood has been appointed manager of the new southern district and will be located in Atlanta. The states of South Carolina, Georgia, Florida, Alabama and eastern Tennessee will be served from this office.

•

Orders Hold Ground; Shipments Decline

New business placed with the electrical machinery industry in December remained about the same as in November, according to figures released by the Bureau of Foreign and Domestic Commerce. The index compiled by the Bureau stood at 238 in December, as compared with 239 (revised) in November.



ELECTRICAL MACHINERY INDICES of Bureau of Foreign and Domestic Commerce. *August orders not plotted. Cancellations exceeded orders. Orders Index has been revised by Bureau from 1939 through 1944

The index covering electrical machinery shipments moved downward during December—to 278 from 285 (revised) in November.

Electrical machinery industries recorded inventory declines of 4 percent in December. The index dropped to 271.6 from 282.3 (revised) in November.

•

Demand Exceeds Supply

Present demand for electrical appliances is far in excess of supply. In a recent release the OPA summarized the situation as follows: refrigerators, present demand at least five times greater than in 1939; washing machines, seven

times greater; vacuum cleaners, six times greater; electric irons, six times greater and electric toasters, six times greater.

•

Manufacturers Issue Earnings Reports

Among the electrical manufacturing companies which recently issued earnings statements are the following:

CUTLER-HAMMER—For 1945, net income $1,279,426, or $1.94 a common share, compared with $1,753,349, or $2.66 a share, in 1944. G. S. Crane, president, reported new orders received at about two and one-half times pre-war rate and unfilled orders "very substantial."

MCGRAW ELECTRIC—For 1945, net income $835,894 after charges, taxes and estimated net renegotiation refund on war contracts, compared with $809,798 in 1944. Current assets at year-end were $5,472,361 and current liabilities $1,663,661.

ELECTRIC STORAGE BATTERY—Fourth quarter sales, including subsidiaries, $14,089,553, of which $2,431,613 were war orders. Unfilled war contract orders at the end of 1945 amounted to $6,164,860.

OHIO BRASS—Including wholly owned subsidiaries, for 1945, net profit $637,344, or $1.83 a common share, against $631,004, or $1.81 a share, in 1944.

ROME CABLE—Nine months to December 31, net profit, $217,899, equal to $1.14 a share, against $402,662, or $2.12 a share, in 1944. December quarter: net profit, $46,126, or 24 cents a share, compared with $144,040, or 76 cents a share, in 1944.

•

Huge Boiler Order Covers Four Units for Sunbury

One of the largest stationary boiler orders ever reported in this country was received last week by Foster Wheeler Corp. from Pennsylvania Power & Light Co. The order, valued at nearly $5,000,000, is for four steam generators which are said to be the largest ever designed for direct firing with pulverized anthracite.

Each of the units will be capable of producing 400,000 lb. of steam per hour at 1,350 psi. and at 955 deg. F. This equipment will be installed in the utility's new 150,000-kw. generating station at Sunbury, Pa. Construction is expected to be completed in the spring of 1948.

•

Fire Extinguisher Contest

A prize contest open to industrial and municipal firemen, safety engineers, and home owners has been announced by F. Dale Bacon, general manager of the fire extinguisher division of the General Detroit Corp. The subject is "My Most Exciting Experience with A Portable Fire Extinguisher." Prizes of $25 each month for the next six months will be paid to the best entry submitted be-

Well-Designed Switchboards include

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Automatic Transfer Switches
Remote Control Switches
Magnetic Contactors
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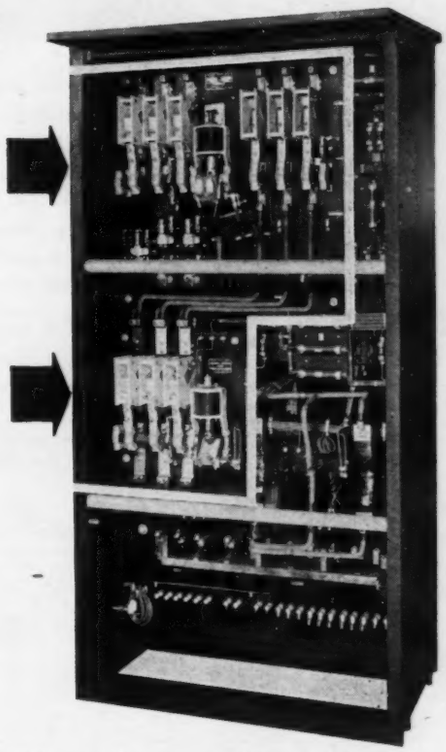
ASCO Switches offer these advantages:



1 mechanically held or electrically held

2 mechanically locked mechanism; simple, sturdy and positive in action

3 flexible design to meet space and performance requirements

4 separate mounting or integral mounting in switchboards or panel boards

These and other ASCO advantages led the manufacturer of the switchboard illustrated to select ASCO Transfer Switches and Relays for his requirements. He wanted only *quality* automatic switches in his products. Isn't that just what you want, too . . . in your product or in your plant?

Circular No. 600 gives further details of ASCO Automatic Switches

Circular No. 200 gives details concerning ASCO Solenoid Operated Valves

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We also manufacture a complete line of Solenoid Operated Valves for Automatic and Remote Control of Liquids and Gases

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• The first woven wire fence, made 63 years ago, bore the name PAGE. Since then the makers have pioneered in many developments to provide betterments in fence quality and service, including Page Chain Link Fence. And now you can again have this sturdy, long-lasting fence in a choice of four superior metals to best meet your needs. Aluminum at lower-than-ever cost. Page Copper-Bearing Steel, heavily galvanized. Page-Allegheny Stainless Steel and Page-Armco Ingot Iron. When you choose Page Fence you deal with a nearby firm which is technically trained, long-experienced and reliable. Write to any office listed below for illustrated information.

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A Lot of Critical Testing to Do

MAKE SURE WITH THE

DILLON DYNAMOMETER

DEAD ACCURATE
EASY TO USE

Takes out guesswork of "sight and sag", or oscillation wire stringing. Hooked on in a jiffy. Indicates tension in seconds. Measures only 8¼" x 6¼" x 3". Capacities 500 to 20,000 lbs.

The Dillon is universally used in telephone work. Accuracy, and long-lived dependability are the answers. Indicates exact tension in guy strand, messenger and wire.

Many other uses where pull, torque, weight or overload are vital factors.

Write, wire or phone for illustrated Dynamometer Manual.

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tween the first and last day of each month. All material received on or before March 31 will apply to this first period.

•

Manufacturers Make Sales Assignments

Electrical manufacturing companies have made the following appointments to their sale staffs:

SIMPLEX WIRE & CABLE CO., has named Arthur W. Coombs New England sales manager. For the past 15 years Mr. Coombs has been sales representative for Simplex in Maine, New Hampshire, Vermont and western Massachusetts.

WAGNER ELECTRIC CORP. has divided the Kansas City territory into two parts. The southern portion, comprising Texas, Oklahoma and parts of New Mexico, Arkansas and Louisiana, is now the Houston branch office territory, with sub-offices at Dallas and Tulsa, with L. J. Ticianne as branch manager. The northern portion continues to be known as the Kansas City branch office territory and is now limited to Kansas and Nebraska and the western halves of Iowa and Missouri, with A. G. Viola as branch manager. Mr. Viola was transferred from the Pittsburgh territory where he was branch manager since 1939. J. L. Pasher, for many years manager of the Pittsburgh Automotive Division branch territory, is now in charge of both the electrical and automotive divisions there.

RUSSELL & STOLL CO., INC., New York, has announced the appointment of Wagner-Green Co., 1935 Euclid Av., Cleveland 15, Ohio, as northern Ohio representatives. P. G. Wagner and R. N. Green both have an industrial-engineering background.

•

Co-ops to Treat Own Poles

Rural Electrification Administration has authorized co-ops in Wyoming to treat their own poles, the National Rural Electric Cooperative Association Magazine, *Rural Electrification*, said in its February issue.

Under the authorized process, osmo salts are applied to the poles which are wrapped and lie exposed to the weather. Exposure is ten days for the first inch of average diameter and five days for each additional inch. As authorized by REA, osmo salts may be used on Douglas fir, western red cedar, western larch, and lodge pole pine poles.

•

Square D to Split Stock

Square D Co. directors have voted to recommend to stockholders at their annual meeting on April 23 that action be taken to increase the capital stock of the company to provide for a common stock split of three for one. Par value of the stock would be changed from $1 to $5 per share.

Sales Opportunities

GEORGIA—Georgia Power Co., Atlanta, plans four new power substations for service for local traction system, to be constructed in different parts of city. Work will form part of 1946 expansion and modernization program for transit lines, scheduled to be placed under way at once.

OHIO—Light and Water Department, Miamisburg, plans expansion and improvements in municipal power plant, including both steam and electric departments, with installation of equipment. Estimates of cost are being made. Fosdick & Hilmer, Union Trust Bldg., Cincinnati, are consulting engineers.

INDIANA—Crosley Corp., Richmond, plans expansion in plant, comprising three new main buildings, each one-story, 200 by 300 ft., 205 by 305 ft., and 62 by 250 ft., with machinery and electrical equipment for large increased capacity. Also will make extensions in power substation facilities, addition to boiler plant, 48 by 70 ft., and new pumping station. Entire project reported to cost over $900,000. Work will begin at early date. John W. Mueller, 12 South Ninth St., Richmond, is engineer.

WYOMING—Bureau of Reclamation, Denver, Colo., will receive bids until April 3 for one 8,300-hp., vertical shaft, single runner, Francis-type hydraulic turbine; one oil-pressure, gate shaft-type governor; and one 6,000-kva., 2,400-volt, three-phase, 60-cycle, vertical shaft a.c. generator, 83.3 percent power factor, suitable for operation in altitude of 4,980 ft., complete with direct-connected exciter, thrust and guide bearings, etc., for installation in Heart Mountain power plant, Shoshone project. Equipment will be installed by government (Specifications 1184).

IOWA—Light and Power Department, Denison, plans expansion and improvements in municipal steam-electric generating station, including installation of equipment. Cost estimated close to $250,000. Proposed to engage engineer soon to prepare plans and specifications.

MISSISSIPPI—Johns-Manville Corp., 22 East 40th St., New York, N. Y., has acquired large tract of land in vicinity of Natchez, and will use as site for new mill for insulating board manufacture. Initial building will be one-story, about 300,000 sq. ft. floor space, with machinery and electrical equipment for rating of 8,000,000 sq. ft. per month. Site is in vicinity of 110,000-volt transmission line of Mississippi Power & Light Co., and power supply will be secured from that source, with power substation to be built at mill. A boiler house is planned. Entire program is reported to cost approximately $5,000,000. Work is scheduled to begin at early date.

WASHINGTON—Bureau of Reclamation, Denver, Colo., will receive bids until April 15 for two vertical shaft centrifugal pumps, each with rating of 63 cu. ft. per sec. at pumping head of 167 ft., and for two vertical shaft 2,200-volt, 1,750-hp. synchronous motors of suitable speed and design for direct-connection to pumps, including individual field-control cubicles, for installation in Pasco pumping station, Columbia Basin project. Equipment will be installed by government (Specifications 1219).

CALIFORNIA—Santa Barbara County Fair Assn., Ray E. Hoey, 435 East Central St.,

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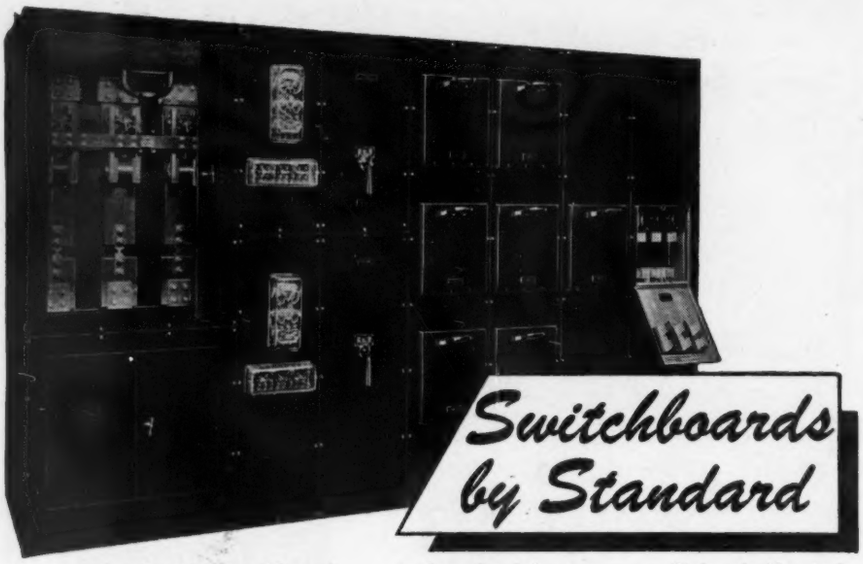

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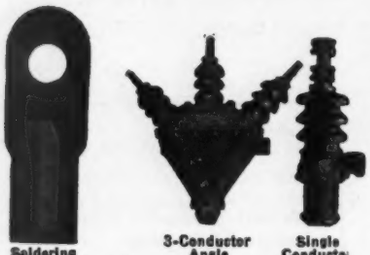

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Santa Maria, plans installation of complete new lighting system at horse show arena at Fair Grounds, Santa Maria. Bids expected to be asked soon.

KANSAS—Water and Light Department, Attica, plans extensions and improvements in municipal power station, with installation of equipment. Cost reported about $50,000. Proposed to arrange bond election to vote funds in near future.

VIRGINIA—Ford Motor Co., Dearborn, Mich., has concluded arrangements for repurchase of former assembling plant at Norfolk, sold to government for use by U. S. Navy in 1942. Plant comprises several buildings on 54-acre tract of land; government will remove machinery at early date, when Ford company will take over and install complete new machinery and electrical equipment for assembling of automobiles and trucks. About $1,000,000 will be expended in re-establishment of plant. Completion is scheduled in June.

CONNECTICUT—Connecticut Power Co., Middletown, plans new power substation at Cromwell. Permission has been secured and work is expected to be carried out in the near future.

CALIFORNIA—Bureau of Reclamation, Denver, Colo., will receive bids until April 9 for three 15 by 19 ft. coaster gates for installation at intakes of penstocks at Shasta Dam, Kennett Division, Central Valley project. Equipment will be installed by government (Specifications 1223).

SOUTH DAKOTA—Town Council, Madison, has been authorized at recent special election to arrange financing in amount of $180,000, to be used for expansion and improvements in municipal power station. Installation will include a 1,600-kw. generator, direct-connected to oil-operated engine of 2,400-hp. rating, and auxiliary equipment. Proposed to proceed at early date.

VIRGINIA—Virginia Electric & Power Co., Richmond, plans extensions in transmission lines, using steel towers, in different parts of state. Contract for required structural steel totaling about 125 tons, is being placed, and work will proceed soon. Stone & Webster Engineering Corp., 49 Federal St., Boston, Mass., is consulting engineer and will supervise construction.

WISCONSIN—City Council, Menomonie, has authorized installation of an improved lighting system on Main St. and Broadway. Estimates of cost and specifications will be arranged at once. J. R. Donaldson is city engineer in charge.

NEW JERSEY—New Jersey Power & Light Co., Dover, has authorized an expansion and improvement program in plants and properties to be carried out over 36-month period; total investment estimated at $3,000,000. Work will include transmission and distributing lines, power substations and other operating facilities. Initial work has been placed under way on new 114,000-volt transmission line from generating station at Whippany to Dover, a distance of approximately 10 miles.

WASHINGTON—Welch Grape Juice Co., Westfield, N. Y., has acquired tract of land at Wenatchee, and will use as site for new plant, for which plans will be prepared soon. It will comprise several one and multi-story buildings for processing, bottling and other service, with machinery and electrical equipment for large output. A power substation is planned, with boiler plant and other utility units. Cost reported over $1,000,000.

Recent Rate Changes

APPALACHIAN ELECTRIC POWER CO. has filed with the West Virginia Public Service Commission reduced rates, which it is estimated will save southern West Virginians $736,000 annually. Most of the reductions will go to commercial users, although larger residential customers will benefit to some extent. The changes will become effective with bills rendered May 1. A new general service rate, which replaces the company's former commercial service rate, will reduce bills of small business users $364,000 a year, based on the energy used in October, 1945. On the same basis, an estimated $304,000 in savings will go to larger commercial users under a large power optional rate effective on bills rendered on or after April 30. Residential consumers will receive a total reduction of $68,000 a year. Comparison of the new residential rates with those effective since 1936 discloses no saving to users of fewer than 70 kw.-hr. per month. The rate remains 5 cents each for the first 30 kw.-hr. per month and 4 cents each for the next 40. A rate of 2.4 cents each for the next 150 kw.-hr. replaces the former rate of 2.5 cents for 230 kw.-hr., after which a charge of 1.5 cents per kilowatt-hour is made.

PUBLIC SERVICE CO. OF OKLAHOMA has recently filed an electric rate schedule, embodying reductions, totaling approximately $652,000 a year for the 222 cities and towns it serves. The new rates became effective following the January meter readings, the State Corporation Commission stated. Reford Bond, commission chairman, said the new schedule would allow the utility an earning capacity of 5.25 percent. Almost half the saving will be in Tulsa, where Paul Reed, commission auditor, stated the reduction will amount to an estimated $306,220 a year. In that city, he said, the average residential rates would be dropped from $3.92 to $3.69 per hundred kilowatt-hours, and commercial and industrial rates were lowered proportionately.

PUBLIC SERVICE CO. OF NEW HAMPSHIRE reduced rates March 1 exceeding $342,000 per year based on 1945 usage, this being the largest reduction in domestic rates ever made in the State, according to Chairman E. H. Hunter of the state Public Service Commission. Over 75,000 customers will benefit. President A. R. Schiller of the utility stated that the average use annually per residential customer is now 1,012 kw.-hr. The first 25 kw.-hr. per month will now cost $1.65 against $2 formerly; at 40 kw.-hr. per month the cost drops to $2.40 from $2.80; and at 100 kw.-hr. to $4.54 from $5. The average monthly bill in 1945 was $3.60. Conferences between the company and the commission preceded the reduction.

WISCONSIN PUBLIC SERVICE CORP. and its subsidiary, the Menominee & Marinette Light & Traction Co., have revised their residential electric rates for approximately 58,250 customers. The new schedules have been approved by the state Public Service Commission. The commission stated the reductions would effect a saving to customers of approximately $130,000 a year.

INDIANA PUBLIC SERVICE COMMISSION has approved lower light and power rates proposed by the Fort Wayne, Ind., municipal utilities and the Indiana Service Corp., Fort Wayne, to effect savings of $201,000 to municipal customers and $175,000 to the customers of the private utility. City light rates affected are: "A-1," general residential service; "A-2," commercial and non-residential service; "A-4," residential lighting,

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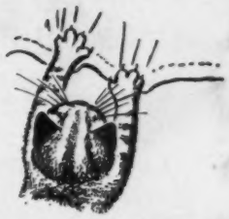

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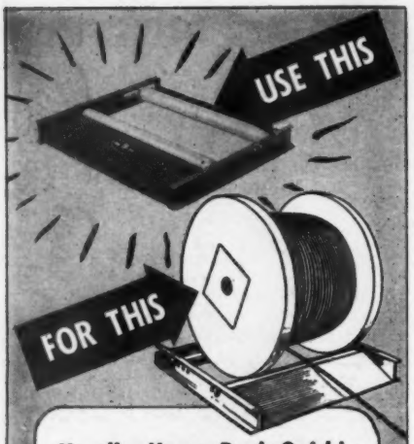

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cooking, and water heating service, and "C-1," commercial and industrial service (ELECTRICAL WORLD, February 16, Page 175). Indiana Service Corp.'s new schedule covers four similar classifications, "R," residential; "R-1," residential customers with both water heaters and electric stoves; "CG," commercial general customers, and "DP," demand or industrial power.

ARIZONA POWER CO. recently offered a rate decrease of about $54,000 annually to its customers in a hearing before the Arizona Corporation Commission, ordered as a result of northern Arizona consumer complaints on excessive charges by the utility. The cut, which was regarded as unimpressive by the commission, was revealed broken down to prove an annual $4 drop on an average consumer's bill.

TUCSON GAS, ELECTRIC LIGHT & POWER CO.'S request for a postponement of the hearing called by the Arizona Corporation Commission on its order against the utility to disclose earnings, income and expenses by class and other information to determine whether a rate reduction should be made, has been granted.

DOTHAN, ALA., CITY COMMISSION has announced a reduction in electric rates affecting more than 1,300 residential consumers using between 101 and 861 kw.-hr. per month and 1,800 using 100 kw.-hr. and less per month, in a revision of a three-months old schedule providing "free current" for customers using upward of 861 kw.-hr. per month. The decrease is expected to save consumers $12,000 a year, according to the announcement.

JACKSON (TENN.) ELECTRIC BOARD has recently voted that industries which use electric energy will no longer pay a monthly surcharge of one percent after April 15. Industrial users will be saved a total of $3,000 a month.

FORT PAYNE (ALA.) IMPROVEMENT AUTHORITY has passed a resolution, reducing electric rates to consumers in the city by 13 percent. Savings to consumers are expected to be $10,300 annually.

•

Recent Legislation

Among the utility bills upon which action has been taken in the various state legislatures are the following:

KENTUCKY—By a vote of 78 to 0 the House passed a bill to extend the scope of rural electric cooperative associations after the House utilities committee had eliminated one section. The deleted section would have allowed the cooperatives to assist customers financially in building and operating of cold storage and processing plants. The bill now goes to the Senate.

NEW YORK—The legislature voted another year's extension of the right of cities to impose a 1 percent tax on gross income or operating income of public utilities. The measure went to Governor Dewey after unanimous passage in the Senate. The Assembly had previously approved the levy. Under the provisions of a bill introduced in the Senate and referred to the internal affairs committee, a new section 120-v is added to the General Municipal Law to provide county shall not acquire property or construct municipal utility outside its boundaries except with consent of local legislative body of

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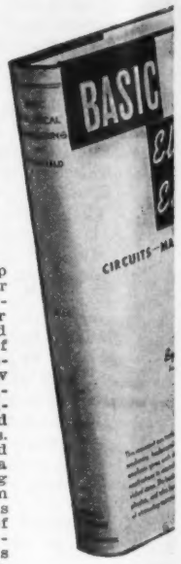

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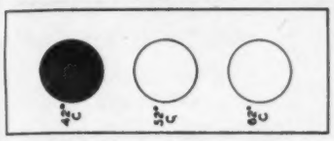

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county through or into which construction is proposed; construction may be made if local authority does not grant or refuse consent within 60 days after application is filed. The Assembly has passed and sent to the Senate the Stephens bill to amend the general city law to enable any city to impose and collect a tax on gross incomes or gross operating incomes of corporations and persons furnishing utility services and providing for the review thereof. A bill has been introduced in the legislature, amending the Conservation Law by prohibiting construction of new or additional reservoirs for regulation of flow of streams by any river regulating board within Adirondack park.

SOUTH CAROLINA—General assembly has passed a bill, approving a loan of $250,000 to be used by the school commissioners of school district No. 1 of Richland County to install adequate lights in the class rooms of the city schools and for other improvements. A. C. Flora, superintendent of city schools, said that an attempt had been made two years ago to install adequate lighting in all the schools, but that prices were prohibitive and materials were not available at that time.

VIRGINIA—House general laws committee has killed bills which would have authorized electric cooperatives to provide telephone service and permitting the establishment of other cooperatives for the purpose of providing telephone service to members.

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M.I.T. Aids Plastics Program

A research program designed to improve service to the public by providing guidance for wiser application of plastics in consumer products has been started at the Massachusetts Institute of Technology, according to an announcement by the Plastic Materials Manufacturers Association. The program will be under the supervision of Prof. A. G. H. Dietz of the institute's department of building engineering and construction, as director of the project.

•

Packaging Exposition Set

The Packaging Exposition of 1946 will be held in the Public Auditorium, Atlantic City, N. J., April 2 to 5, inclusive, 1946, the American Management Association, sponsoring organization, has announced. Some 150 leading manufacturers of equipment, machinery, supplies and services essential to the field of packaging, packing and shipping, will participate.

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Aids Disposal of Surplus

Kellogg Switchboard & Supply Co., Chicago, acting as general agent for the RFC, has opened a special branch office in San Antonio, Tex., to facilitate the sale of surplus communications material for the government. More than $1,250,000 worth of communications equipment has been turned over to the Kellogg surplus material division for disposal.

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